541-232

MISSION OPERATIONS AND DATA SYSTEMS DIRECTORATE

NASA Communications (Nascom) Small Conversion Device (SCD) Operator's Guide Release 3

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National Aeronautics and Space Administration

Goddard Space Flight Center
Greenbelt, Maryland

NASA Communications (Nascom)
Small Conversion Device (SCD)
Operator's Guide
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Preface

This document is under the configuration management of the NASA Communications (Nascom) Configuration Control Board (CCB).

Configuration Change Requests (CCRs) to this document shall be submitted to the Nascom CCB, along with supportive material justifying the proposed change. Changes to this document shall be made by document change notice (DCN) or by complete revision.

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Abstract

This operator guide specfication presents the contents and format of the operator interface, and provides instructions for operations of the Nascom Small Conversion Device (SCD).

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Section 1. Introduction

1.1 Purpose

This Small Conversion Device (SCD) Operator's Guide, 541-232, provides instructions for monitoring and control of the SCD.

1.2 Background

NASA Communications is a support element of the NASA Space Tracking Data Network (STDN) providing common carrier communications services and supporting the transfer and switching of data among other network control and support elements and STDN customers. Data currently travels through the network on dedicated serial links in a pre-defined 4800-bit block format using a NASA proprietary protocol.

Nascom has committed itself to transition to an Internet Protocol (IP) network which will support state-of-the-art communication technology as well as reduce long-term maintenance costs.

The Nascom Network provides high speed message switching of 4800-bit blocks via the Message Switching System and circuit switching capabilities via the Multiplexer/Demultiplexer (MDMs)/Digital Matrix Switch (DMS) interfaces. Together these systems support over 500 circuits to over 25 locations outside GSFC and 20 locations within the GSFC campus. Nascom's objective is to transition these 4800-bit block sites to the Nascom Internet Protocol Operational Network (IONET). The Multiplexer/Demultiplexers at WSC and JSC will also be modified to provide an IP interface. The role of the Small Conversion Device is to provide those 4800-bit block serial end users the 'low-cost' capability to communicate with the Nascom IP network. The SCDs shall be deployed at the user sites during the transition period between August 1996 and July 1997.

1.3 Small Conversion Device Description

1.3.1 SCD Hardware Description

The SCD is a PC-based system which will accept 4800-bit block serial input and convert it to IP-based output, and conversely will accept IP-based input and transmit 4800-bit serial blocks to the end user. It is intended to operate similar to a "black box" with minimal operator intervention. Its configuration will be provided and controlled by the IONET Network Management System (NMS).

The SCD implementation is centered around the Nascom Interface Board (NIB), a serial line card, which is also used in operational systems including the Nascom Tracking Data System (TDS). The NIB has an EIA-449 connector to receive and transmit 4800-bit blocks. The SCD also has an Ethernet connection to support UDP/IP communications.

1.3.2 SCD Software Description

The SCD software consists of a control (SCNTR) process which starts other processes based on the configuration file and an operator interface (SOI) process which is started when logging into one of the captive SCD accounts. The following processes will be started by SCNTR based on the SCD configuration file:

- Serial output (SSERO) - receives de-encapsulated 4800-bit block messages from the UDP input process and writes them to the NIB card (a SSERO process is started for each NIB card that is configured as present and enabled for writing)
- Serial input (SSERI) - reads 4800-bit block messages from the NIB card and sends them to either the Fixed or Table UDP output process (based on the configuration file) to be encapsulated and transmitted out the Ethernet card (a SSERI process is started for each NIB card that is configured as present and enabled for reading)
- UDP input (SUDPI) - reads the UDP encapsulated 4800-bit block messages and sends them to the specified serial output process based on joined group information specified in the SCD configuration file
- Fixed UDP output (SUDPO) - receives 4800-bit block messages from a serial input process and encapsulates them in UDP messages and transmits them out the Ethernet card to the specified IP address (this process does not look at the destination code in the Nascom header)
- Table UDP output (SUDPO) - receives 4800-bit block messages from a serial input process and encapsulates them in UDP messages and transmits them out the Ethernet card to the specified IP address (the IP address is determined by looking up the destination code, specified in the Nascom header, in the MSS routing table)
- Build configuration table (SCFG) - reads the SCD configuration and MSS routing table files and builds the internal shared memory tables and then notifies the SCD control process of any table changes
- SNMP Agent (SNMP-A) - interface between the Network Management System (NMS) and the SCD. This process receives requests (gets or sets) from the NMS and sends status responses back to the NMS. This process also sends unsolicited statuses (traps) to the NMS.
- SNMP Statistics (SSTAT) - reads the NIB statistics and stores them in the internal share memory tables for the SNMP Agent.

Figure 1-1 shows the interaction between the various SCD processes.

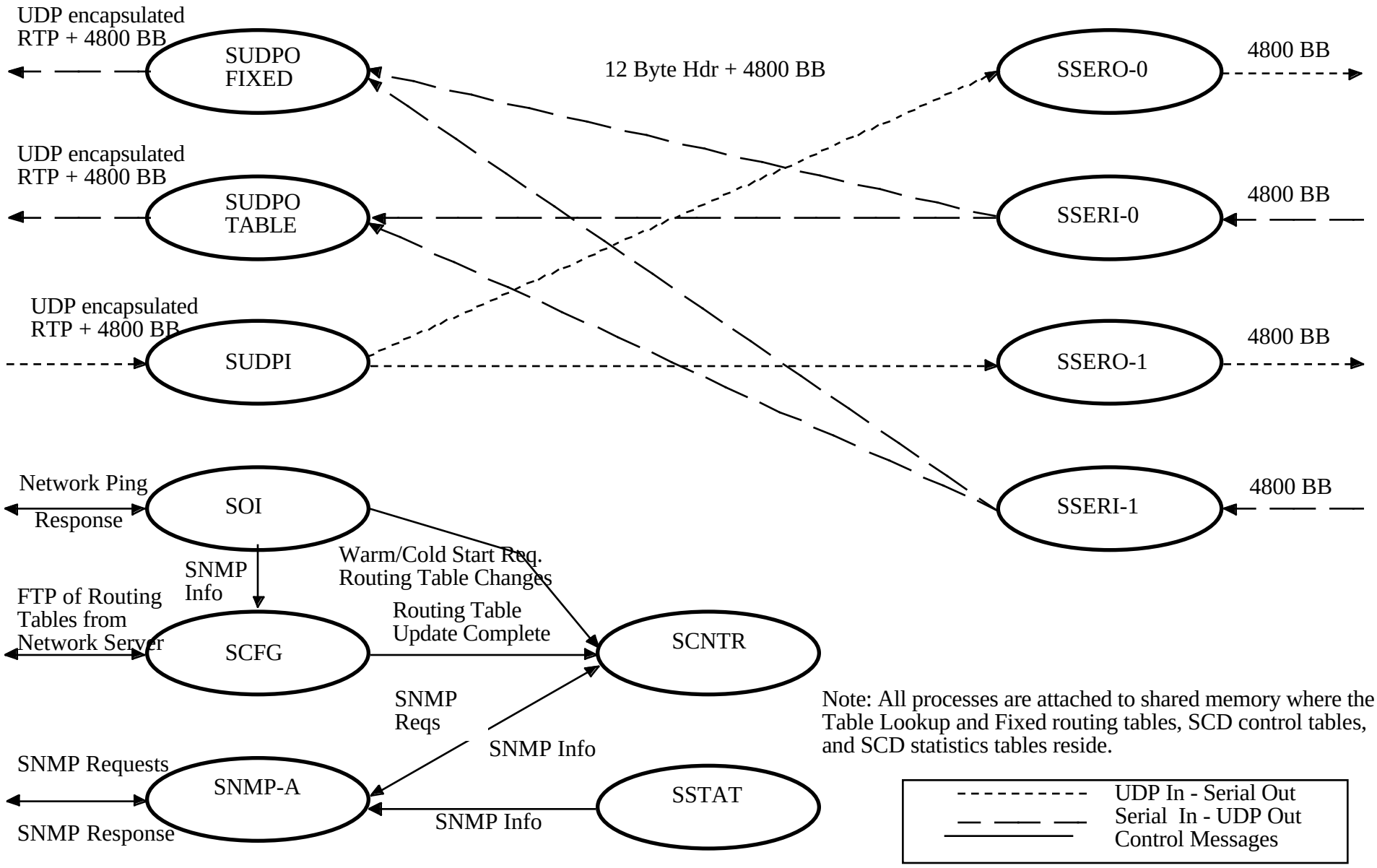

Figure 1.1 SCD Processes

1.4 Organization

Following the Introduction (Section 1), this document presents procedures and reference material on the specified topics in the following order:

a. SCD Installation and Startup (Section 2)

b. Menus and Displays (Section 3)

c. Alerts and Error Messages (Section 4)

1.5 Reference Documents

a. *NASA Communications (Nascom) Small Conversion Device (SCD) Requirements Document,* June 1996.

b. *NASA Communications (Nascom) Internet Protocol (IP) Transition Data Format Document,* June1996.

c. *Nascom IP Transition Project Transition Plan,* June 1996.

Section 2. Software Installation and Startup

2.1 Introduction

The SCD software is delivered on 3 1/2" diskettes and installed onto the SCD disk via the installation procedure described in Section 2.2. After software installation is complete, the SCD can be started by following the steps outlined in Section 2.3.

2.1.1 User Logins

To login to the SCD, the operator can either use a console attached to the SCD or telnet to the SCD using an X-term window that supports VT100 emulation. Three login accounts are provided: scdops, scdadmin, and scdcm. The scdops and scdadmin accounts have captive login shells (i.e. no access to operating system commands) that will start the SCD Operator Interface process (SOI). In the case of the scdadmin account, an administrative privilege flag is set to allow the operator to modify the SCD configuration. The scdcm account has a captive login shell (i.e. no access to operating system commands) that will provide a CM menu to load the SCD software, load the SCD configuration file, or create a SCD configuration backup.

2.2 Software and Configuration Installation

The following menu is provided in the captive scdcm account to load the SCD software, load the SCD configuration, or create a SCD configuration backup (operator input is in bold type):

a. At the SCD login prompt, enter the userid and password

   scda login: **scdcm**

   password: **scdcm-password**

b. The following menu appears:

   SCD CM Menu

   1. Load SCD Software From Floppy
   2. Load SCD Configuration From Floppy
   3. Create SCD Configuration Floppy
   4. Logout

   Enter Selection:

c. To load the SCD software from floppy:

Enter Selection: **1**

When the SCD Software floppy disk has been inserted in drive,

Hit Return key to continue: <**Return**>

Loading SCD Software from floppy

< list of all files copied from floppy >

The SCD CM Menu will then be displayed.

d. To load the SCD configuration from floppy:

Enter Selection: **2**

When the SCD Configuration floppy disk has been inserted in drive,

Hit Return key to continue: <**Return**>

Loading SCD Configuration from floppy

< list of all configuration files copied from floppy >

The SCD CM Menu will then be displayed.

e. To create a SCD configuration floppy:

Enter Selection: **3**

When formatted floppy disk has been inserted in drive,

Hit Return key to continue: <**Return**>

Creating SCD Configuration on floppy

< list of all configuration files copied to floppy >

The SCD CM Menu will then be displayed.

f. To logout:

Enter Selection: **4**

Logging Out

The SCD login prompt will then be displayed.

The new SCD software and/or configuration is now ready to be started (see Section 2.3).

If an invalid floppy is loaded into the drive, one of the following messages may be displayed:

· Warning SCD Application Software is not present on this machine

· Error: Unable to expand diskette tar file

Check that correct SCD APP SW diskette is loaded

- Error:

  SCD APP SW was not loaded from floppy

  and no online backup is available.

  SCD is NOT operational.

  Find diskette and rerun this procedure,

  or use the FTP procedures to access the fileserver

  and retrieve a current copy of the software.

- Restoring saved SCD Configuration files
- Error: Unable to load SCD configuration from diskette
- Error: Failed to write SCD configuration to diskette

  Is floppy in the drive ?

  Is it formatted ?

  (Unix, Linux, DOS, or OS/2 format is fine)

  Is it write protected ?

- Invalid Selection Was Entered
- login interrupted - logging out

2.3 System Startup

2.3.1 SCD Control Startup

When the SCD is booted the operating system will proceed with system initialization and SCD startup. Any errors encountered during startup will be reported to the Network Operations Center (NOC) via standard IP messages. For more details on SCD startup errors and alerts, see Section 4. An SNMP agent will be implemented in a future release of the SCD software.

Section 3. Menus and Displays

3.1 Menus and Displays Overview

The SCD menu system is a hierarchy of selection menus and data entry prompts designed for easy access and convenience. Figure 3-1 is an example of a SCD window display followed by a description of the display components.

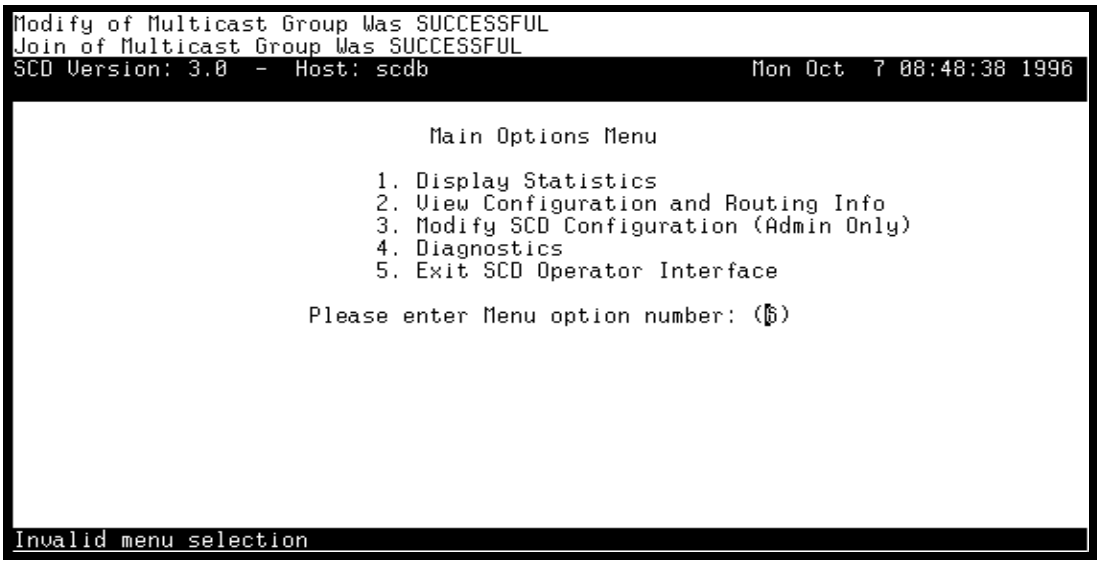

Figure 3-1. SCD Window Format

a. Alerts Region: Alerts and error messages appear in the upper portion of the screen and scroll off the top as new messages appear. If no new alerts are displayed, the current alert messages will scroll up one line every 8 seconds until the alert area is cleared. See Section 4 for more details on alerts.

b. Status Line: This reverse-video line serves as a visual separator between the alerts and menu/display regions. It displays the SCD software release number, the host name, and system date and time on the first line. If the SCD is used as an Message Switching System (MSS) Gateway, there will be a (GW) at the end of the host name. The second line contains menu-related instructions and data entry guidance.

c. Menu and Display Region: The SCD menus and displays appear in the central portion of the screen. For displays which are longer than the space in this region, press the down-arrow cursor key to advance to the next display page; press the up-arrow key to move back one page. If selections show a selection highlight, press the left-arrow key to move up one selection and the right-arrow key to move down one selection.

d. Data Entry Error Line: The last line on the screen is reserved for messages related to data entry keyins or menu selections. All error messages will be in reverse-video.

NOTE

The figures in this section which depict the SCD menus do not show superfluous alert messages so that the menu/display text and status line are more apparent.

3.1.1 Data Entry Presentation Types

There are three presentation types for obtaining user input in the SCD: selection menus, selection lists, data entry forms.

3.1.1.1 Selection Menus

Selection menus request a numeric keyin that matches one of the displayed options. An example of this presentation type is the SCD main menu (see Figure 3-2). The SCD has a menu history feature which allows a user to press <Escape> to return to the previous (last) menu. Invalid entries result in one of the following messages in the data entry error line (last line on screen):

- Invalid menu selection
- Must be a numeric entry

3.1.1.2 Selection Lists

Selection lists present a number of options which vary depending on the operational environment and scenarios. An example of this presentation type is the SCD Modify/Leave Multicast Group selection list (see Figure 3-19). The list remains on the screen until a selection is made from the list by pressing <Control>-p or <Escape> is pressed to exit from the list.

3.1.1.3 Data Entry Forms

Data entry forms display prompts for keyins or selections. An example of this presentation type is the configuration change for a station, where the station name must be entered. The size of the keyin area indicates the maximum length of the keyin. Invalid entries result in one of the following messages in the data entry error line (last line on screen):

- Must be a numeric entry
- Must be an octal entry
- Must be an alphabetic-only entry
- Must be an alphabetic or numeric entry

NOTE

The generic data entry errors noted above are not repeated in the menu descriptions detailed in this section. Menu selections and keyins are validated and these error messages are displayed as required; only data entry errors specific to the individual menu are listed in the descriptions.

3.1.2 Data Display Types

There are two types of displays in the SCD: repeating data and fixed data display screens.

3.1.2.1 Repeating Data Display Screens

These screens are similar to the dynamic selection lists except they do not allow a selection. The display may be spread over numerous screens, each accessed by the up-arrow and down-arrow paging keys. To scroll forward and backward among individual display items, the right-arrow key and left-arrow key may be used respectively. An example of a dynamic display screen is the Table Routing display.

3.1.2.2 Fixed Data Display Screens

These screens are similar in appearance to the data entry forms, except that the individual data items are not contained within parenthesis. An example of a fixed data display screen is the SCD Configuration Table display.

3.2 SCD Menus and Displays

3.2.1 Main Options Menu

The SCD provides functions for viewing statistics, viewing the configuration, modifying the configuration, and diagnostics. After logging into the SCD, the Main Options Menu in Figure 3-2 will appear:

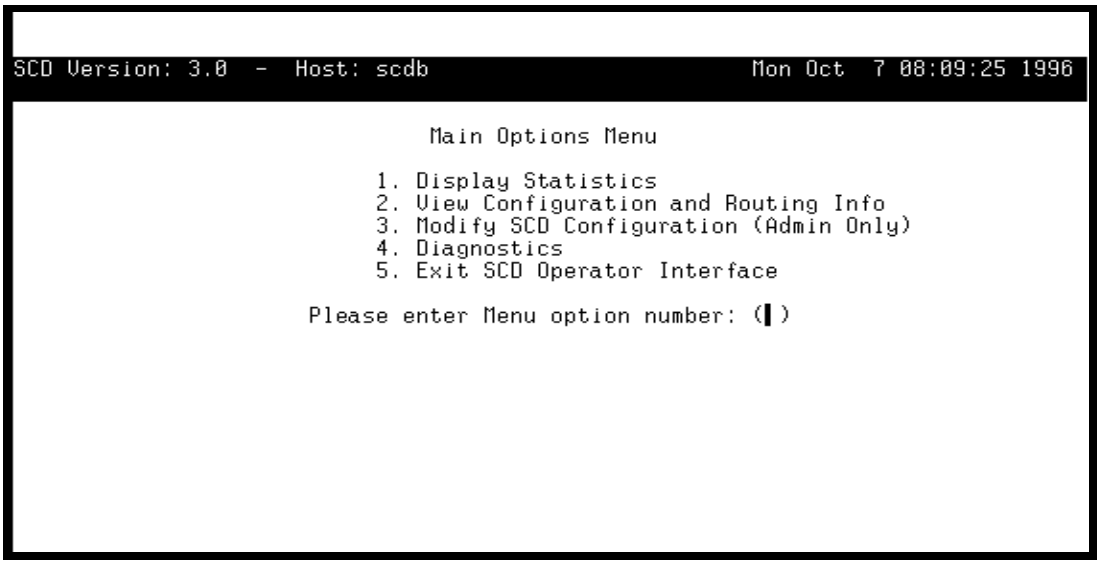

Figure 3-2. Main Options Menu

The additional menus provide the following functions:

- Display of Statistics - view the statistics that have been collected (detail, source, destination, data format code, and sequence errors).
- View Configuration and Routing Information - view the serial interface configuration, table and fixed routing information, joined multicast groups, miscellaneous configuration items, and the SCD process status information.
- Modify SCD Configuration (Admistrative Function Only) - modify the SCD configuration (this includes Fixed routing but, does not include the Table-Lookup routing table), join new multicast groups, modify or leave a current multicast group, modify miscellaneous configuration items, initiate a check for a new configuration file, initiate a warm or cold start of the SCD.
- Diagnostics - send a system ping command to a specified host, send of test blocks is not yet implemented (NYI)

Upon selecting an option from the main menu, the requested menu will be displayed.

3.2.2 Statistics Options Menu

The SCD provides the capability to view the statistics that have been collected. If "1" was selected from the Main Options Menu, the Statistics Options Menu in Figure 3-3 will appear:

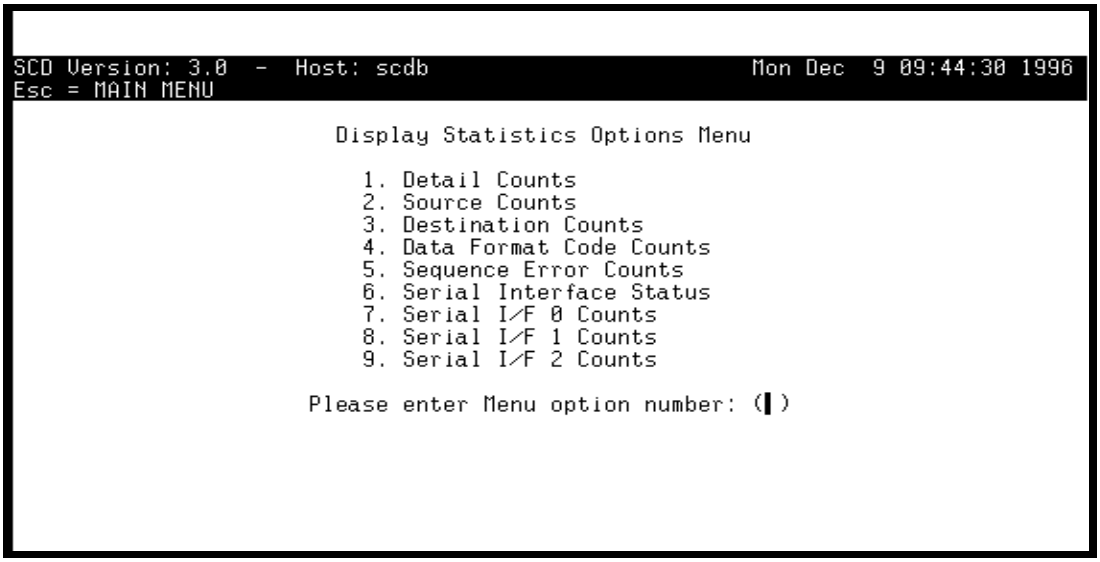

Figure 3-3. Statistics Options Menu

Upon selecting an option from the statistics options menu, the requested display will appear.

3.2.2.1 Detail Counts Display

To view the current SCD detail counts, select “1” from the Statistics Options Menu and the Detail Counts display in Figure 3-4 will appear:

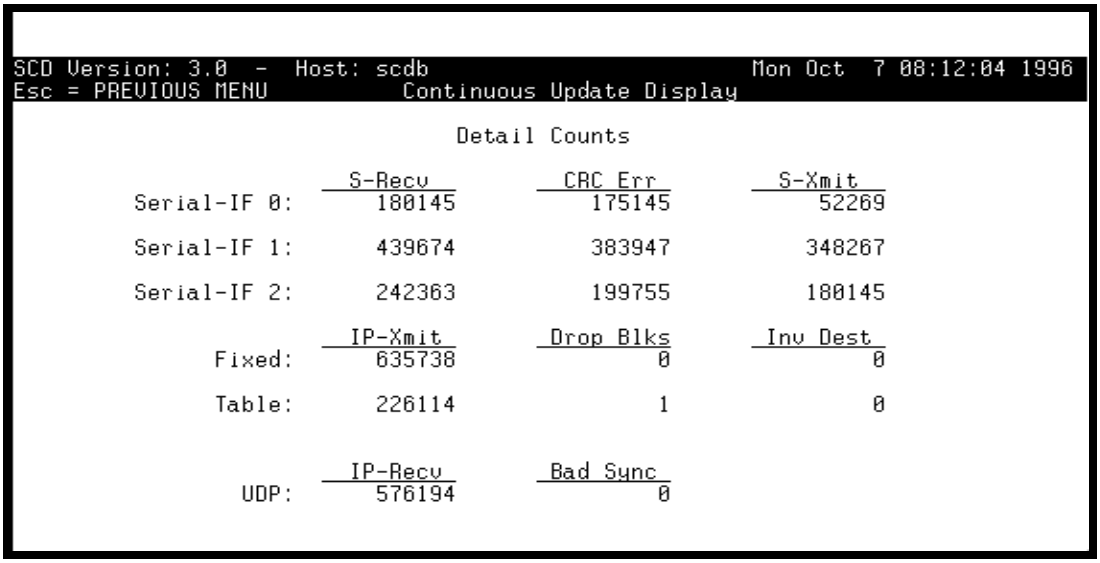

Figure 3-4. Detail Counts Display

The display contains formatted information on the following:

- Serial I/F 0, 1, and 2:
    - Serial Blocks Received - number of blocks successfully read, including any that had CRC errors
    - CRC Errors - number of blocks where a CRC error was detected
    - Serial Blocks Transmitted - number of blocks successfully transmitted
- Fixed/Table Routing:
    - IP Blocks Transmitted - number of blocks successfully written out the IP connection
    - Dropped Blocks - number of blocks dropped because the routing information was being updated when the block was received
    - Invalid Destination - number of blocks dropped because the Table Routing table had no IP address associated with the Destination code in the block (not applicable to fixed routing)
- UDP:

- IP Blocks Received - number of IP blocks successfully read not including those with a bad Nascom sync
- IP Blocks Read With Bad Sync - number of IP blocks read where no Nascom sync was detected

3.2.2.2 Source Counts Display

To view the current SCD source counts, select "2" from the Statistics Options Menu and the Source Counts display in Figure 3-5 will appear:

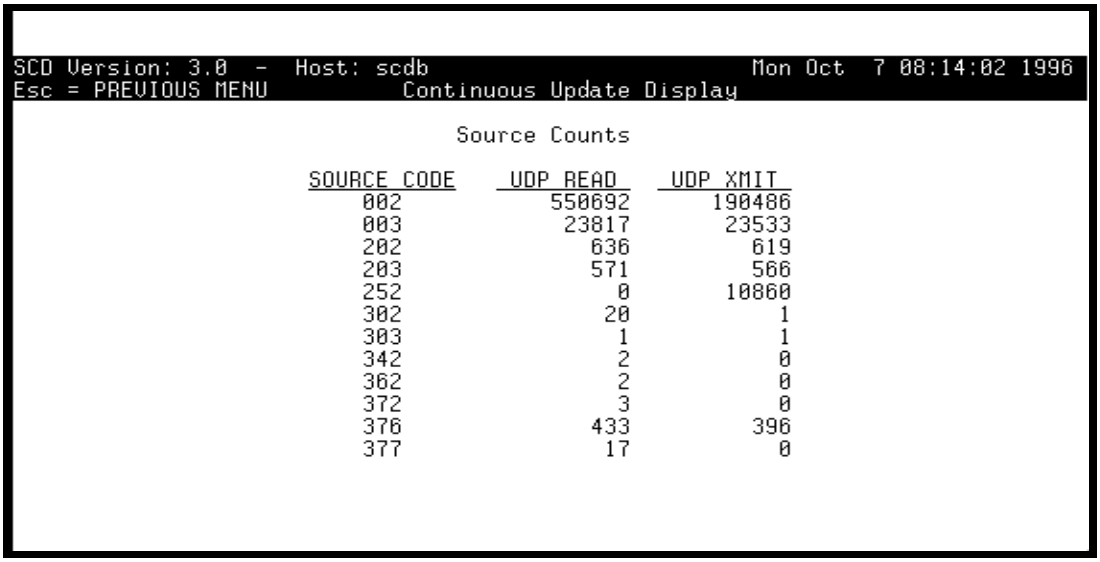

Figure 3-5. Source Counts Display

This display contains formatted information on the following:

- Source Code - the source code specified in the Nascom header
- UDP Blocks Received - number of UDP blocks read which have a particular source code value. The counts are only meaningful for Table routing (ie. data routed through the MSS)
- UDP Blocks Transmitted - number of blocks received on all Table routed serial boards counted by the block's source code. The blocks are then transmitted UDP.

3.2.2.3 Destination Counts Display

To view the current SCD destination counts, select “3” from the Statistics Options Menu and the Destination Counts display in Figure 3-6 will appear:

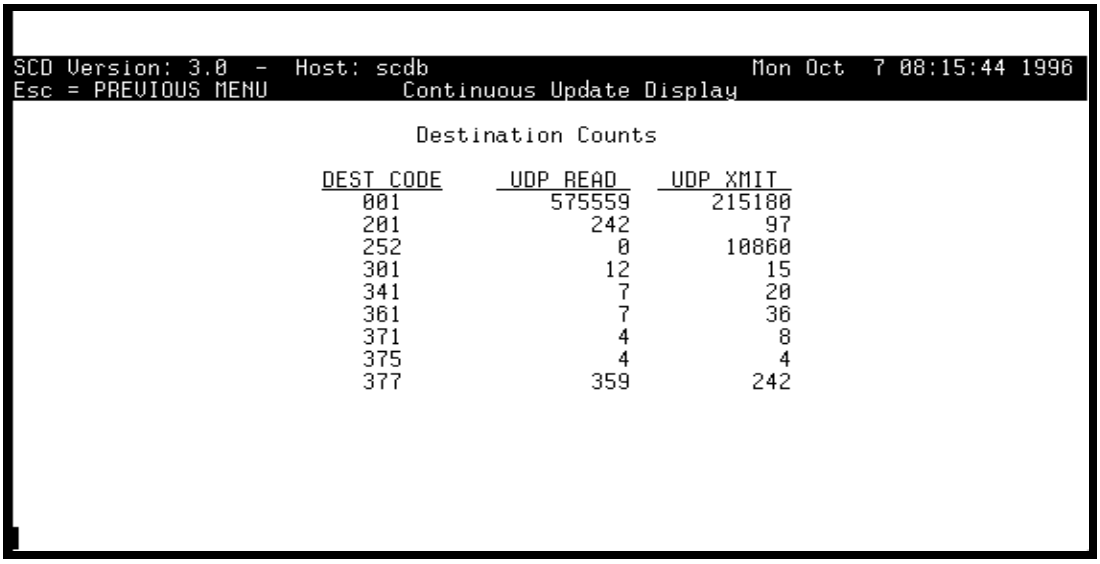

Figure 3-6. Destination Counts Display

This display contains formatted information on the following:

- Destination Code - the destination code specified in the Nascom header
- UDP Blocks Received - number of UDP blocks read which have a particular destination code value. The counts are only meaningful for Table routing (ie. data routed through the MSS)
- UDP Blocks Transmitted - number of blocks received on all Table routed serial boards counted by the block’s destination code. The blocks are then transmitted UDP.

3.2.2.4 Data Format Code Counts Display

To view the current SCD data format code counts, select “4” from the Statistics Options Menu and the Data Format Code Counts display in Figure 3-7 will appear:

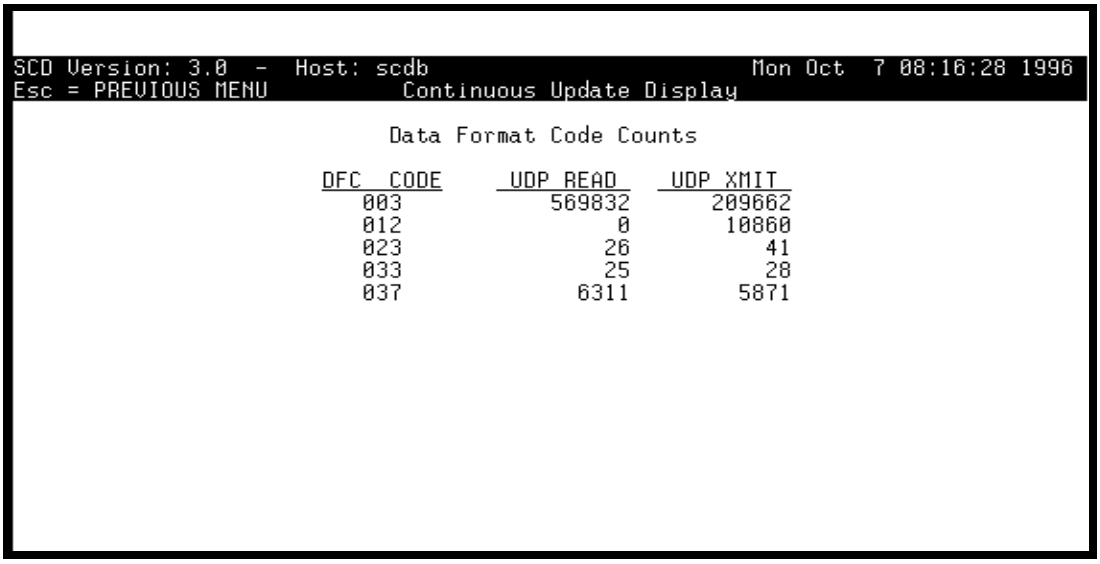

Figure 3-7. Data Format Code Counts Display

This display contains formatted information on the following:

- Data Format Code - the data format code specified in the Nascom header
- UDP Blocks Received - number of UDP blocks read which have a particular data format code value. The counts are only meaningful for Table routing (ie. data routed through the MSS)
- UDP Blocks Transmitted - number of blocks received on all Table routed serial boards counted by the block’s data format code. The blocks are then transmitted UDP.

3.2.2.5 Sequence Error Counts Display

To view the current SCD sequence error counts, select “5” from the Statistics Options Menu and the Sequence Error Counts display in Figure 3-8 will appear:

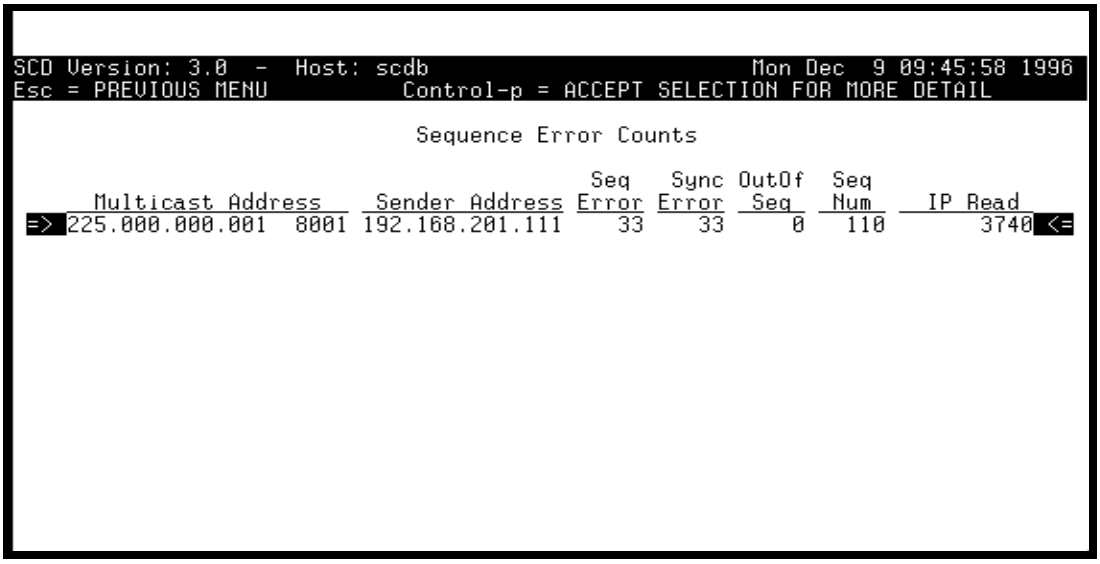

Figure 3-8. Sequence Error Counts Display

This display contains formatted information on the following:

- Multicast Address - the joined multicast group IP address
- Sender Address - the IP address where the data originated
- Sequence Errors - the number of times an incoming block sequence number did not match the current sequence number from a particular sender address/multicast address source
- Sequence Sync Errors - the number of times that incoming blocks have been received with a sequence number that differed from the current sequence number by a specified threshold value. When this occurs, the current sequence number is set to 1 greater than the number in the incoming block.
- Out Of Sequence Errors - the number of times that incoming blocks have been received with a sequence number out of order (i.e. 3,4,6,5 would count as 1 block out of sequence)
- Current Sequence Number - the sequence number expected in the next block from the sender address. When a good block is received the sequence number is incremented by 1. The sequence number is not incremented when a sequence error occurs (with the exception of a sequence sync error). The sequence number wraps to 0 after reaching 65535.

· Number of IP Blocks Read - the number of IP blocks read that were received from the specified multicast address/sender address combination.

To view the current SCD sequence detail counts for the selected multicast addres/sender address combination, enter <Control>p from the Sequence Error Counts display and the Sequence Detail Counts display in Figure 3-9 will appear:

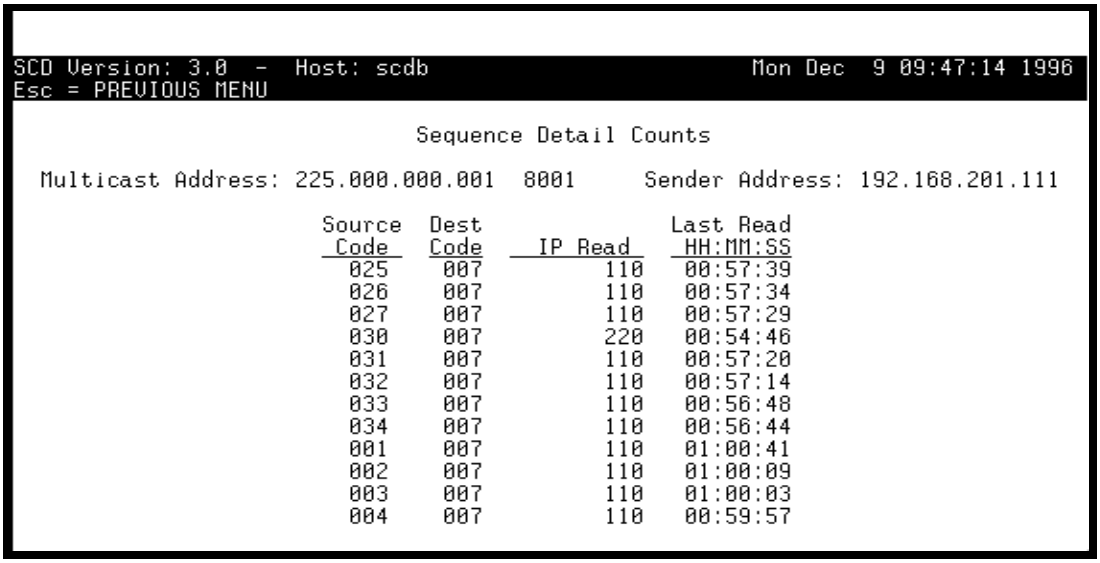

Figure 3-9. Sequence Detail Counts Display

This display contains formatted information on the following:

· Multicast Address - the joined multicast group IP address and port number

· Sender Address - the IP address where the data originated

· Source Code - source code specified in the block

· Destination Code - destination code specified in the block

· IP Blocks Read - total IP blocks read from the specified combination

· Time Since Last Read - the time (in HH:MM:SS format) since the last block was received from the specified combination

3.2.2.6 Serial Interface Status Display

To view the current SCD serial interface status, select “6” from the Statistics Options Menu and the Serial Interface Status display in Figure 3-10 will appear:

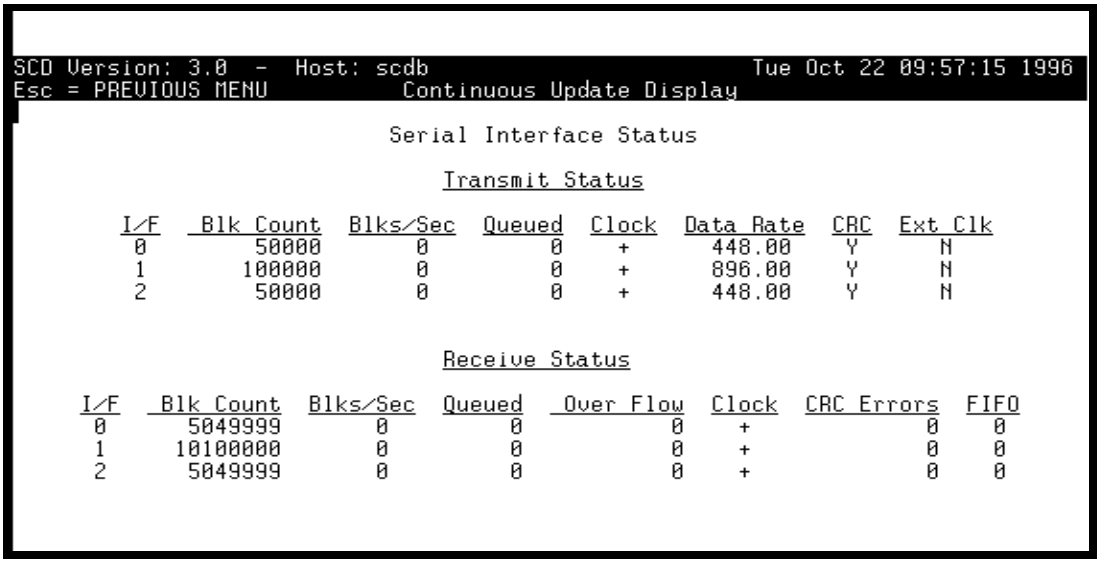

Figure 3-10. Serial Interface Status Display

This display contains formatted information on the following:

Transmit Status:

- I/F - the serial interface board 0, 1, or 2
- Block Count - the number of blocks transmitted
- Blocks Per Second - the number of blocks transmitted per second
- Blocks Queued - the number of blocks queued in the NIB driver to be transmitted
- Clock - indicates whether or not a clock was detected (+ = clock, - = noclock, blank = board not set to transmit)
- Data Rate - the configured or detected data rate of the board
- CRC - indicates if CRC is enabled (N = not enabled, Y = enabled)
- External Clock - indicates if board is configured for external clock (N = internal clock, Y = external clock

Receive Status:

- I/F - the serial interface board 0, 1, or 2
- Block Count - the number of blocks received
- Blocks Per Second - the number of blocks received per second
- Blocks Queued - the number of blocks queued in the NIB driver to be read
- Over Flow - the number of blocks dropped because the receive queue in the NIB driver was full
- Clock - indicates whether or not a clock was detected (+ = clock, - = noclock, blank = board not set to receive)
- CRC Errors - the number of CRC errors encountered
- FIFO - the number of times the FIFO (First In First Out) receive queue on the board has overflowed

3.2.2.7 Serial Interface Counts Display

To view the current SCD serial interface counts for the desired board, select “7”, “8”, or “9” from the Statistics Options Menu and the Serial Interface Counts display in Figure 3-11 will appear:

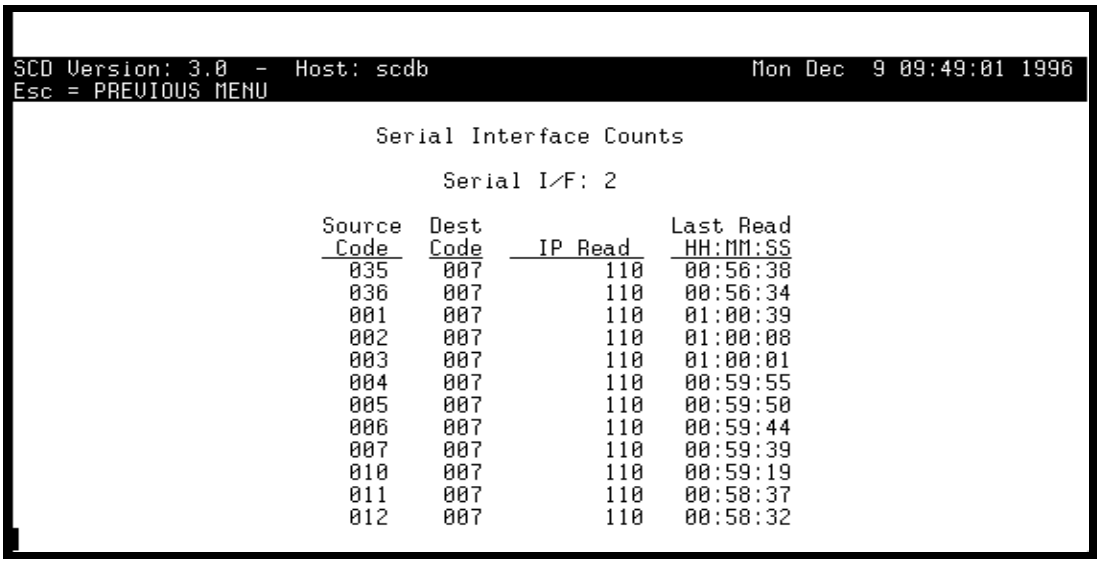

Figure 3-11. Serial Interface Counts Display

This display contains formatted information on the following:

Transmit Status:

- Serial I/F - the serial interface board 0, 1, or 2

- Source Code - source code specified in the block
- Destination Code - destination code specified in the block
- IP Blocks Read - total IP blocks read from the specified combination
- Time Since Last Read - the time (in HH:MM:SS format) since the last block was received from the specified combination

3.2.3 View Configuration and Routing Info Options Menu

The SCD provides the capability to view the current SCD configuration and routing information. If "2" was selected from the Main Options Menu, the View Configuration and Routing Info Options Menu in Figure 3-12 will appear:

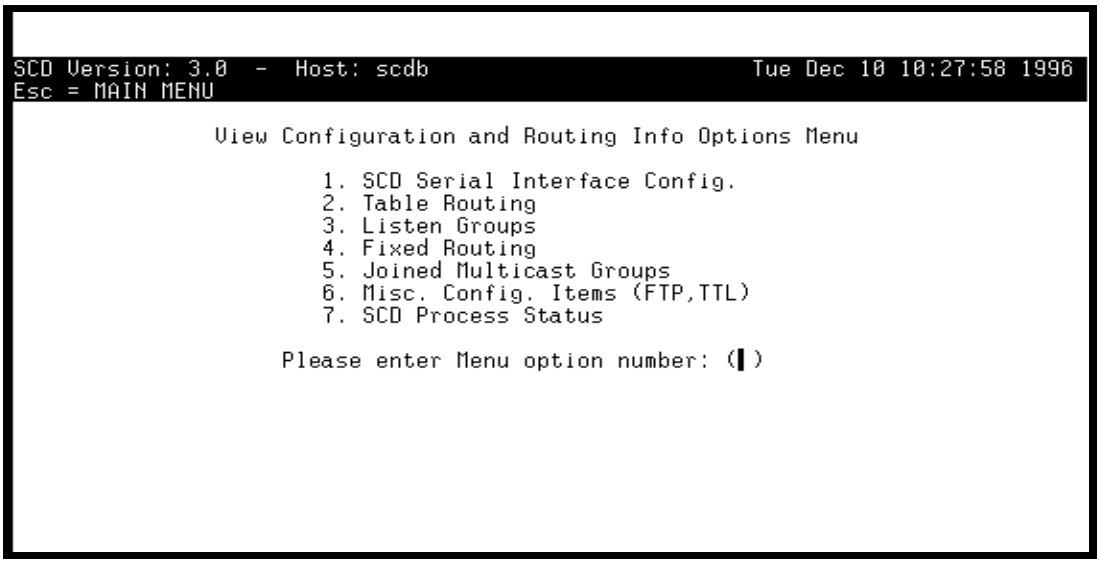

Figure 3-12. View Configuration and Routing Info Options Menu

The Joined Multicast Groups and the SCD Process Status displays will refresh every 5 seconds. Upon selecting an option from the statistics options menu, the requested display will appear.

3.2.3.1 SCD Serial Interface Configuration Display

To view the current SCD serial interface configuration, select “1” from the View Configuration and Routing Options Menu and the SCD Serial Interface Configuration display in Figure 3-13 will appear:

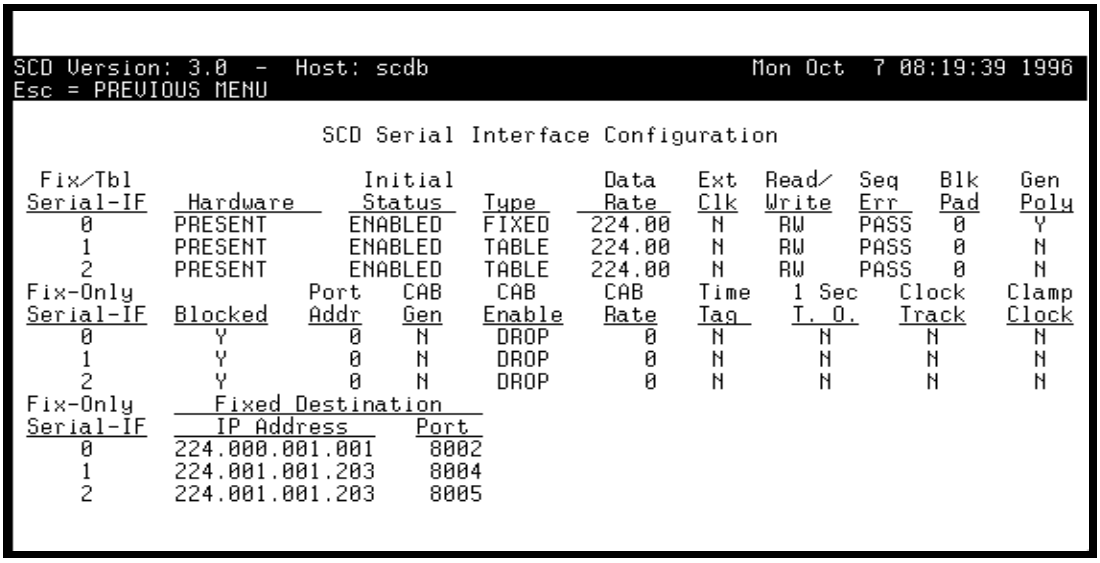

Figure 3-13. SCD Serial Interface Configuration Display

This display contains formatted information on the following:

- Fix/Tbl - refers to parameters that are used for both Fixed and Table routing
- Fix-Only - refers to parameters that are used for Fixed routing only

Fix/Tbl Line:

- Serial I/F - specifies the board number (0, 1, or 2)
- Hardware - specifies whether the Serial I/F board (NIB) is physically installed (Present or Not-present)
- Initial Status - specifies the initial status of the Serial I/F at startup (Enabled or Disabled)
- Type - specifies the type of routing - (Table or Fixed)
- Data Rate - specifies the rate of the internal clock used for transmitting data.
- External Clock - specifies whether or not an external clock is to be used (Y or N)
- Read/Write - specifies the direction of the I/O on the board (R, W, or RW)

- Sequence Error - specifies whether or not blocks received out of sequence should be PASSed or DROPped
- Block Padding - specifies the number of pad bytes to put between blocks
- Generate Poly - causes the board to generate a CRC poly code on outbound data (Y or N)

Fix-Only Line 1:

- Serial I/F - specifies the board number (0, 1, or 2)
- Blocked - Always Yes (included for completeness)
- Port Address - logical port address (included for completeness)
- CAB Generate - specifies that CAB should be generated (Y or N)
- CAB Enable - specifies whether or not CAB should be passed or dropped (Y or N)
- CAB Rate - specifies the frequency (in milli seconds) of CAB generation (0-1000)
- Time Tag - Not Implemented
- 1 Second Time Out - Always No (included for completeness)
- Clock Track - Always No (included for completeness)
- Clamp Clock - Always No (included for completeness)

Fix-Only Line 2:

- Serial I/F - specifies the board number (0, 1, or 2)
- Destination IP Address/Port - specifies the IP Address/Port where all incoming blocks are to be routed

3.2.3.2 Table Routing Display

To view the current SCD table lookup routing table, select “2” from the View Configuration and Routing Options Menu and the Table Routing display in Figure 3-14 will appear:

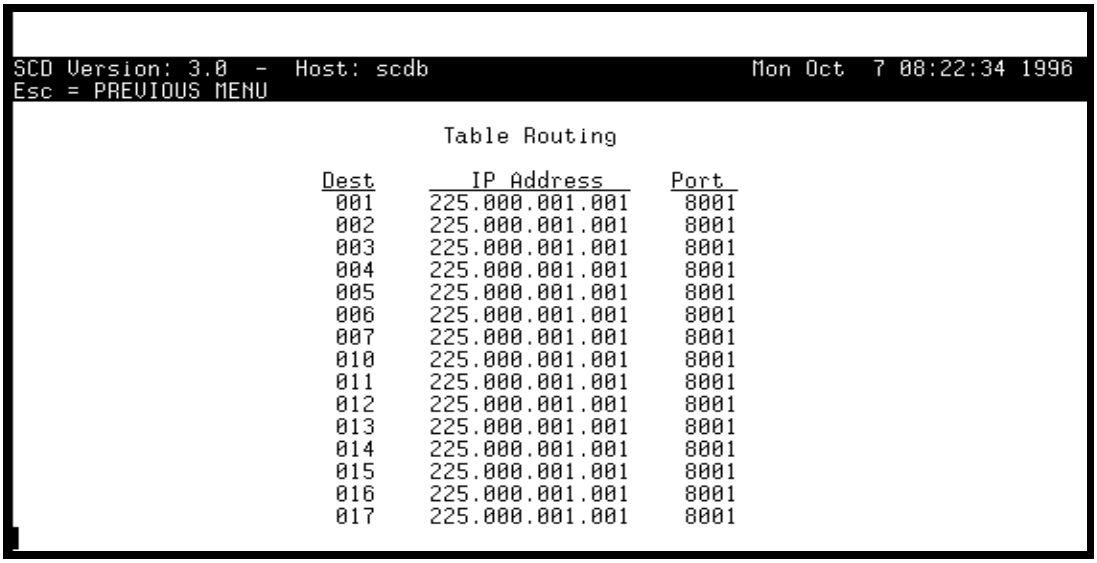

Figure 3-14. Table Routing Display

This display contains formatted information on the following:

- Destination Code - the destination code specified in the Nascom header
- IP Address/Port - for the specified destination code the blocks will be routed to the specified IP Address/Port

3.2.3.3 Listen Group Table Display

To view the current SCD listen group table, select “3” from the View Configuration and Routing Options Menu and the Listen Group Table display in Figure 3-15 will appear:

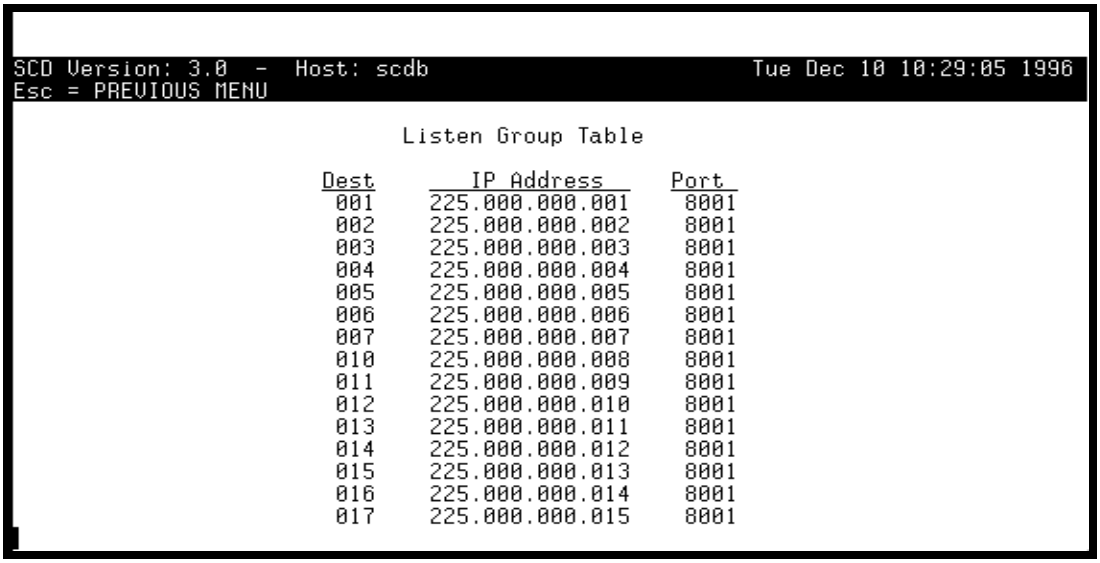

Figure 3-15. Listen Group Table Display

This display contains formatted information on the following:

- Destination Code - the destination code specified in the Nascom header
- IP Address/Port - for the specified destination code the multicast address and port that will have to be joined to receive data for that destination

3.2.3.4 Fixed Routing Display

To view the current SCD fixed routing table, select “4” from the View Configuration and Routing Options Menu and the Fixed Routing display in Figure 3-16 will appear:

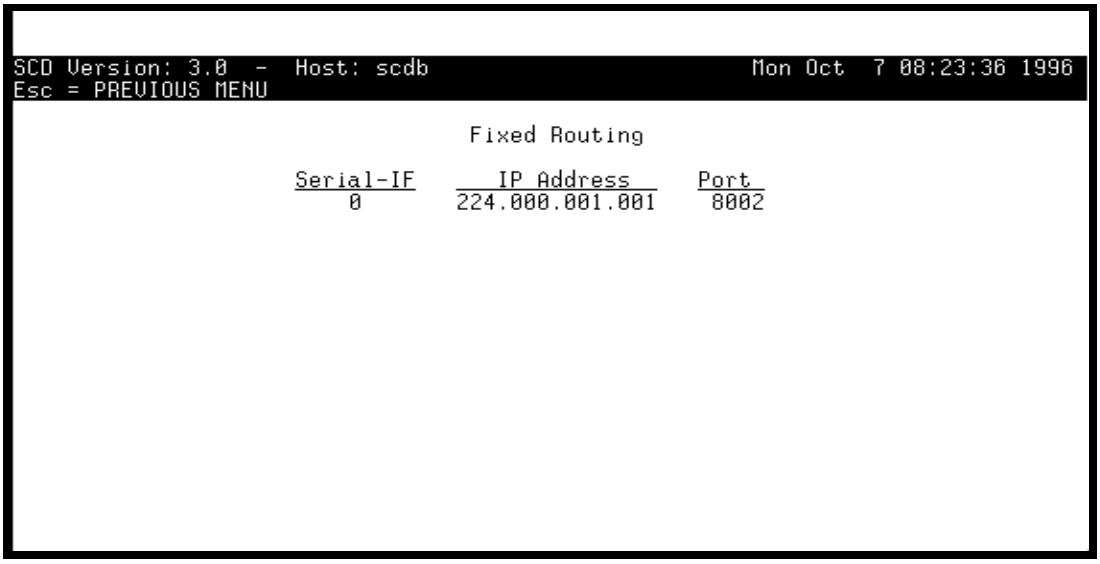

Figure 3-16. Fixed Routing Display

This display contains formatted information on the following:

- Serial I/F - the Nascom Interface board (0, 1, or 2)
- IP Address/Port - specifies that any data coming in on the specified serial interface should be routed to the specified IP address and port.

3.2.3.5 Joined Multicast Groups Display

To view the currently joined multicast groups, select “5” from the View Configuration and Routing Options Menu and the Joined Multicast Group display in Figure 3-17 will appear:

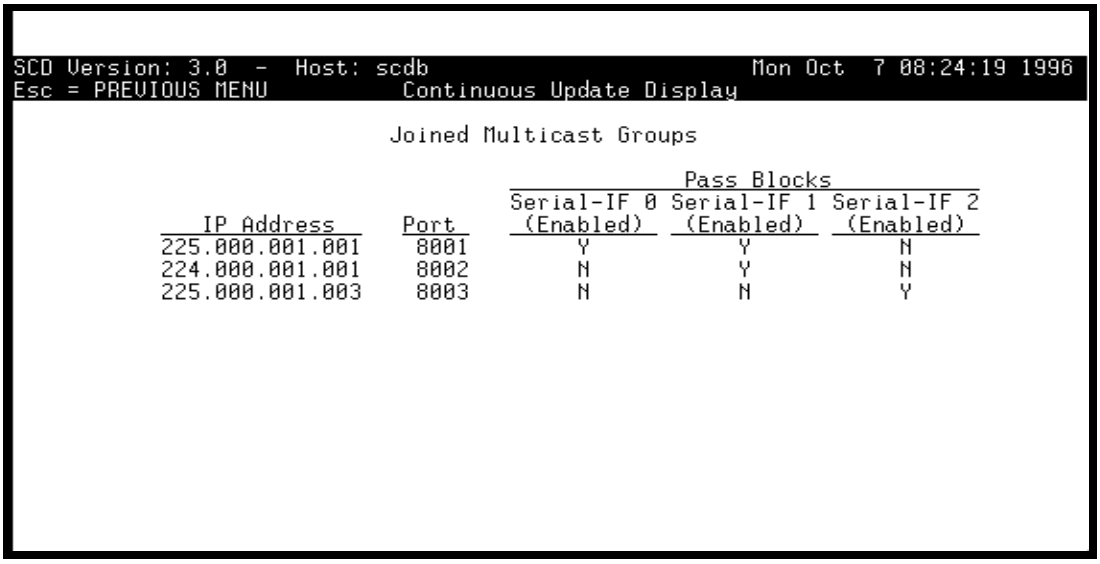

Figure 3-17. Joined Multicast Group Display

This display contains formatted information on the following:

- IP Address/Port - specifies the multicast group address and port to listen for data
- Serial I/F 0/1/2 - specifies whether or not data received from the multicast group specified by IP Address and Port should be passed to Serial I/F 0, 1, or 2 (Yes or No) and whether or not the board is enabled or disabled. If the board is disabled, no data will be passed until the board has been enabled.

3.2.3.6 Misc. Config. Items Display

To view the current SCD miscellaneous configuration items, select “6” from the View Configuration and Routing Options Menu and the Misc. Config. Items display in Figure 3-18 will appear:

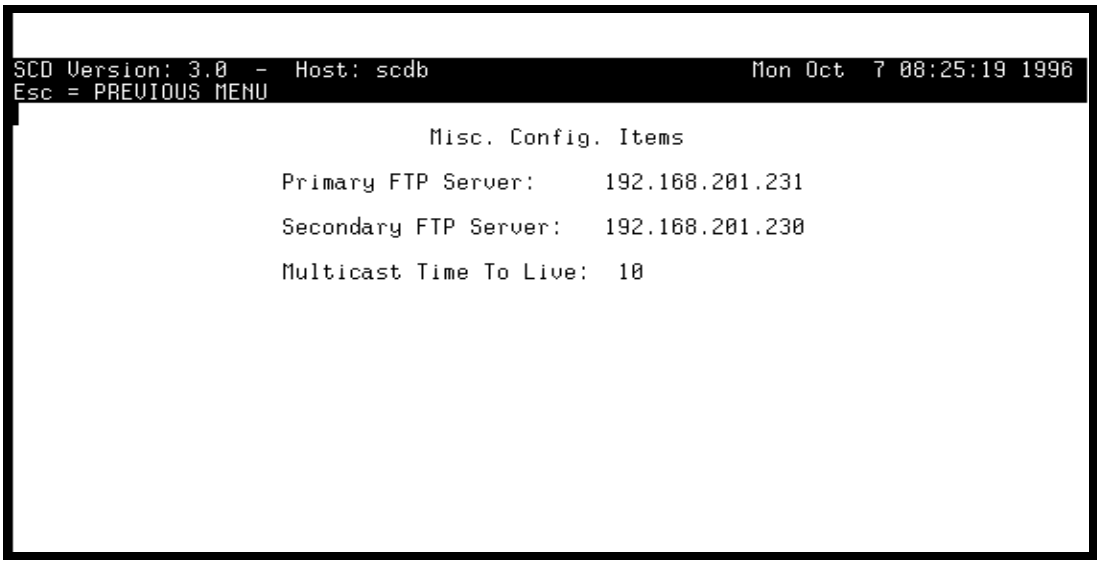

Figure 3-18. Misc. Config. Items Display

This display contains formatted information on the following:

- Primary FTP Server - specifies the IP address of the primary system where configuration and routing table files can be obtained using FTP
- Secondary FTP Server - specifies the IP address of the secondary system where configuration and routing table files can be obtained using FTP
- Multicast Time To Live - specifies the number of jumps that a message can make before timing out

3.2.3.7 Process Status Display

To view the current SCD process status, select “7” from the View Configuration and Routing Options Menu and the Process Status display in Figure 3-19 will appear:

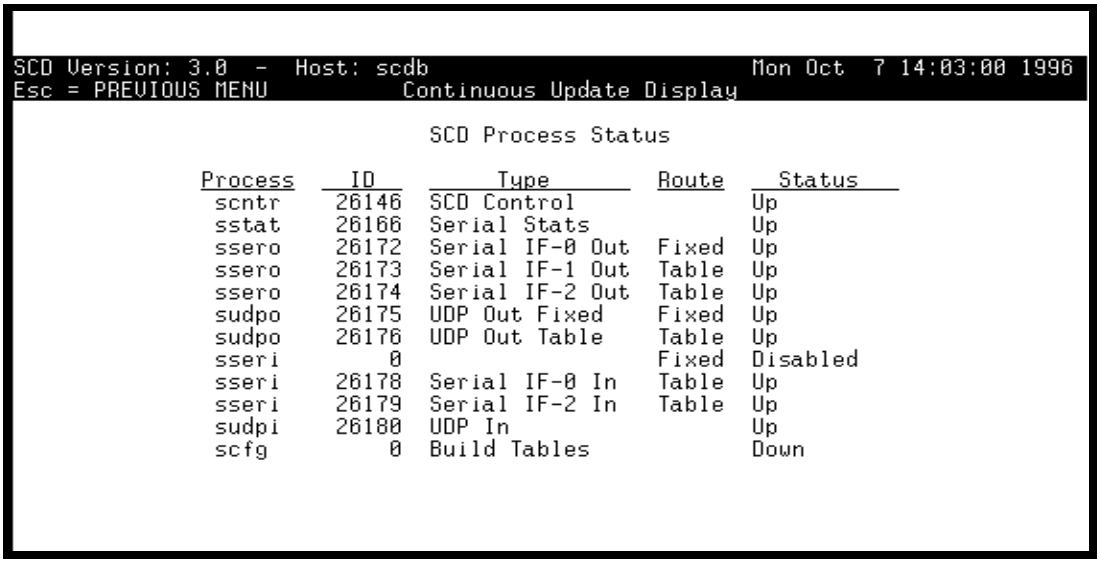

Figure 3-19. Process Status Display

This display contains formatted information on the following:

- Process Name - specifies the name of the SCD process (scntr, sstat, ssero, sudpo, sseri, sudpi, and scfg)
- Process ID - specifies the system assigned ID of the process
- Process Type - specifies the type of the process that is running (SCD Control, Serial Stats, Serial IF-0 Out, Serial IF-1 Out, Serial IF-2 Out, UDP Out Fixed, UDP Out Table, Serial IF-0 In, Serial IF-1 In, Serial IF-2 In, UDP In, and Build Tables)
- Type of Routing - specifies whether Table or Fixed routing should be used
- Process Status - specifies the current status of the process (Starting, Up, Terminating, Down, Restarting, Disabled)

For a description of the SCD processes, refer to section 1.4.2 SCD Software Description.

3.2.4 Modify SCD Configuration Options Menu

The SCD provides the capability to modify the current SCD configuration if you are logged on as an administrative user. If "3" was selected from the Main Options Menu, the Modify SCD Configuration Options Menu in Figure 3-20 will appear:

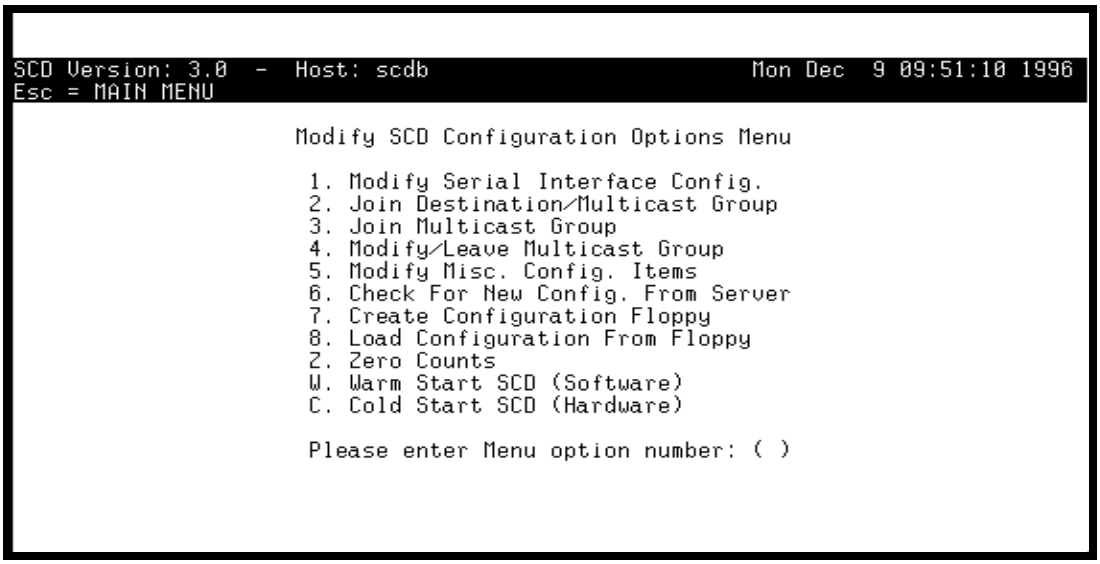

Figure 3-20. Modify SCD Configuration Options Menu

Upon selecting an option from the modify SCD configuration options menu, the requested display will appear.

3.2.4.1 Modify Serial Interface Configuration Display

To modify the current SCD serial board configuration, select “1” from the Modify SCD Configuration Options Menu and the Modify Serial Interface Configuration display in Figure 3-21 will appear:

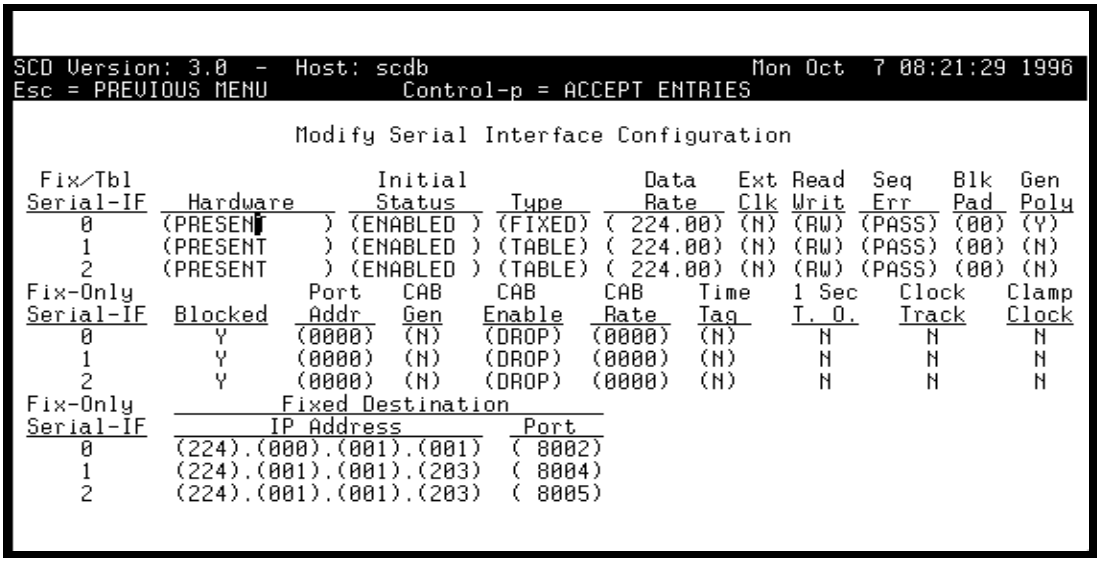

Figure 3-21. Modify Serial Interface Configuration Display

This display contains formatted information on the following:

· Fix/Tbl - refers to parameters that are used for both Fixed and Table routing

· Fix-Only - refers to parameters that are used for Fixed routing only

Fix/Tbl Line:

· Serial I/F - specifies the board number (0, 1, or 2)

· Hardware - specifies whether the Serial I/F board (NIB) is physically installed (PRESENT or NOT-PRESENT)

· Initial Status - specifies the initial status of the Serial I/F at startup (Enabled or Disabled)

· Type - specifies the type of routing - (TABLE or FIXED)

· Data Rate - specifies the rate of the internal clock used for transmitting data.

· External Clock - specifies whether or not an external clock is to be used (Y or N)

· Read/Write - specifies the direction of the I/O on the board (R, W, or RW)

- Sequence Error - specifies whether or not blocks received out of sequence should be PASSed or DROPped
- Block Padding - specifies the number of pad bytes to put between blocks
- Generate Poly - causes the board to generate a CRC poly code on outbound data (Y or N)

Fix-Only Line 1:

- Serial I/F - specifies the board number (0, 1, or 2)
- Blocked - Always Yes (included for completeness)
- Port Address - logical port address (included for completeness)
- CAB Generate - specifies that CAB should be generated (Y or N)
- CAB Enable - specifies whether or not CAB should be passed or dropped (Y or N)
- CAB Rate - specifies the frequency (in milli seconds) of CAB generation (0-1000)
- Time Tag - Not Implemented
- 1 Second Time Out - Always No (included for completeness)
- Clock Track - Always No (included for completeness)
- Clamp Clock - Always No (included for completeness)

Fix-Only Line 2:

- Serial I/F - specifies the board number (0, 1, or 2)
- Destination IP Address/Port - specifies the IP Address/Port where all incoming blocks are to be routed

To modify an entry, use the Tab or arrow keys to position the cursor to the desired field. Use the Backspace key to delete the current data and key in the desired value. Press <Control>p to apply the new values.

If no errors were encountered, the configuration file is updated and written to floppy (if a floppy is present in the floppy drive). SCNTR is then notified of the changes so that the appropriate action can be taken. Some changes take effect immediately (no interruption in data flow) and some require that a process be terminated and restarted for the change to take effect (data flow is interrupted). A change in the Port Address field has no effect on processing, it is maintained for documentation purposes only.

The changes that take effect immediately are:

- Sequence Error (PASS or DROP)

- CAB Generate (Y or N)
- CAB Enable (Y or N)
- CAB Rate (0-1000)

The changes that require processes to be terminated and be restarted are:

- Type (TABLE or FIXED)
- Data Rate
- External Clock (Y or N)
- Read/Write (R, W, or RW)
- Block Padding
- Generate Poly (Y or N)
- Destination IP Address/Port

3.2.4.2 Join Destination/Multicast Group Display

To join a multicast address by selecting the destination code, select "2" from the Modify SCD Configuration Options Menu and the Join Destination/Multicast Group display in Figure 3-22 will appear:

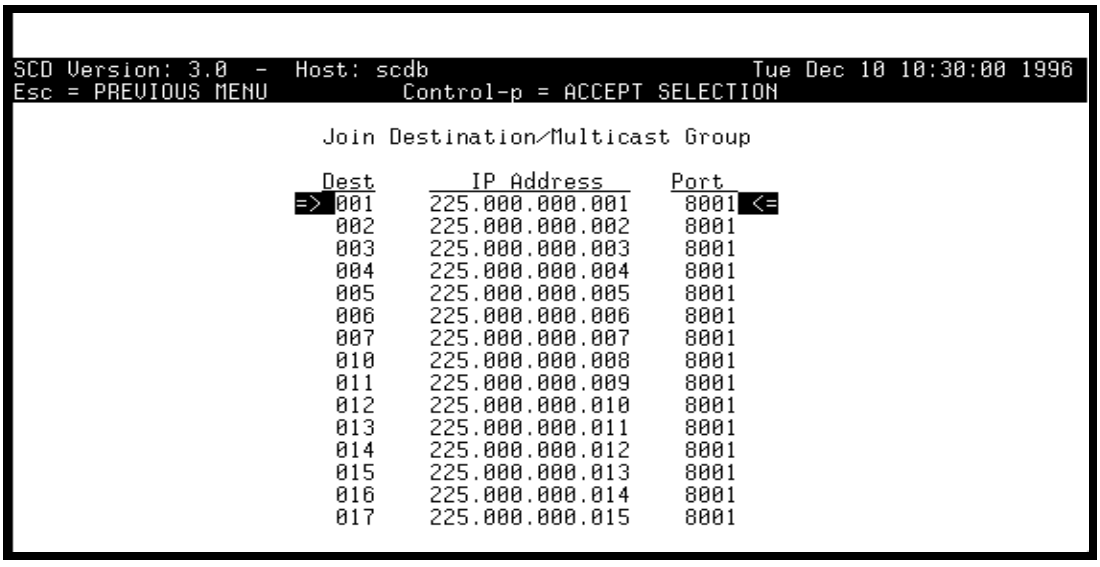

Figure 3-22. Join Destination/Multicast Group Display

This display contains formatted information on the following:

- Destination Code - the destination code specified in the Nascom header
- IP Address/Port - for the specified destination code the multicast address and port that will have to be joined to receive data for that destination

After highlighting the desired destination/address, press <Control>p. The Join Multicast Group data entry display in Figure 3-21 will appear with the selected information filled in.

3.2.4.3 Join Multicast Group Display

To join a multicast group and modify the current SCD configuration, select "3" from the Modify SCD Configuration Options Menu and the Join Multicast Group display in Figure 3-23 will appear:

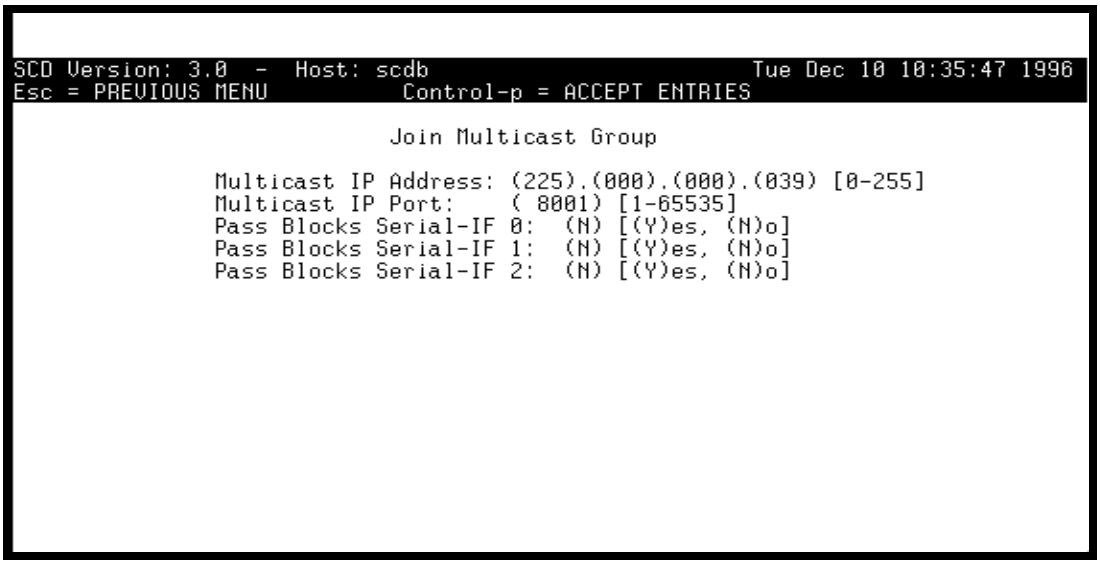

Figure 3-23. Join Multicast Group Display

This display contains the following data entry fields:

- Multicast IP Address - the IP address of the multicast group to be joined (default of 225.0.0.0 when selected from the main menu or the selected address from the Join Destination/Multicast Group display)
- Multicast IP Port - the IP port of the multicast group to be joined (default of 8001 when selected from the main menu or the selected port from the Join Destination/Multicast Group display)
- Pass Blocks Serial I/F 0 - indicates whether or not to pass blocks through to Serial I/F 0 (Y or N)
- Pass Blocks Serial I/F 1 - indicates whether or not to pass blocks through to Serial I/F 1 (Y or N)

· Pass Blocks Serial I/F 2 - indicates whether or not to pass blocks through to Serial I/F 2 (Y or N)

To modify an entry, use the Tab or arrow keys to position the cursor to the desired field. Use the Backspace key to delete the current data and key in the desired value. Press <Control>p to apply the new values.

If no errors were encountered, the configuration file is updated and written to floppy (if a floppy is present in the floppy drive). The SUDPI process will check the updated shared memory tables and will join the specified group if one of the boards marked 'Y' is enabled or will mark the group as reserved until one of the boards marked 'Y' is enabled.

3.2.4.4 Modify/Leave Multicast Group Display

To modify or leave a currently joined multicast group and modify SCD configuration, select "4" from the Modify SCD Configuration Options Menu and the Modify/Leave Multicast Group display in Figure 3-24 will appear:

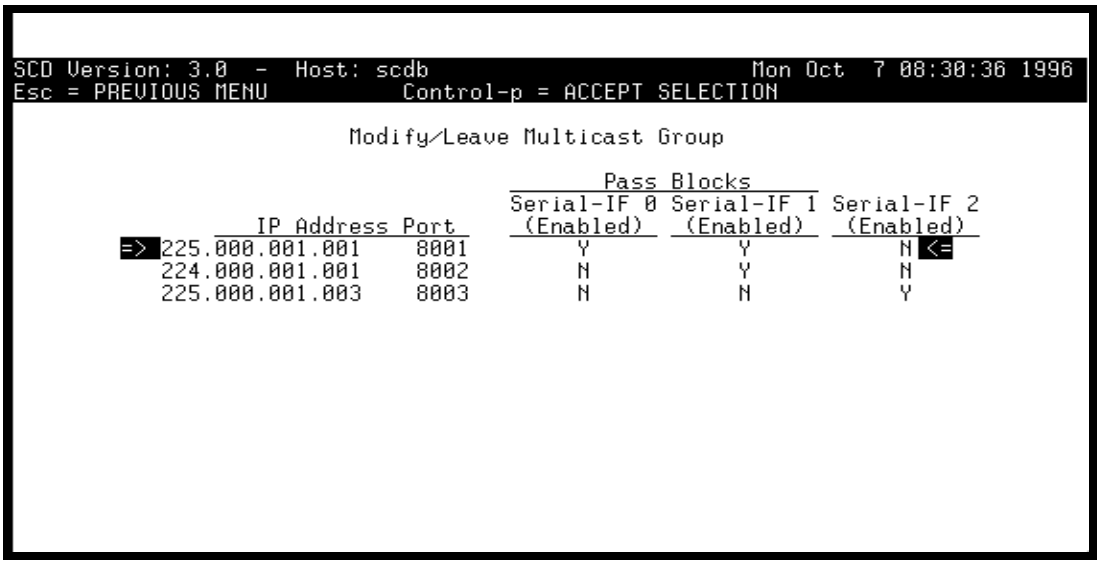

Figure 3-24. Modify/Leave Multicast Group Display

This display contains formatted information on the following:

· Multicast IP Address - the IP address of the multicast group to be modified or left

· Multicast Port - the IP port of the multicast group to be modified or left

· Pass Blocks Serial I/F 0 - indicates whether or not to pass blocks through to Serial I/F 0 (Y or N) if it is enabled

· Pass Blocks Serial I/F 1 - indicates whether or not to pass blocks through to Serial I/F 1 (Y or N) if it is enabled

· Pass Blocks Serial I/F 2 - indicates whether or not to pass blocks through to Serial I/F 2 (Y or N) if it is enabled

After highlighting the desired group, press <Control>p. The Modify/Leave Multicast Group data entry display in Figure 3-25 will appear:

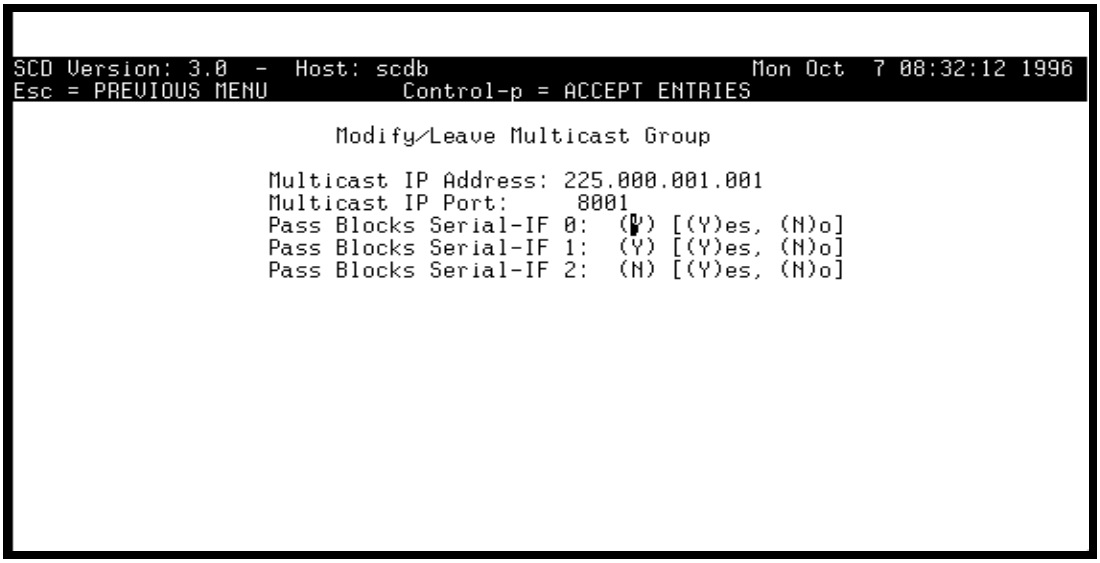

Figure 3-25. Modify/Leave Multicast Group Data Entry Display

This display contains formatted information on the following:

· Multicast IP Address - the IP address of the multicast group to be modified or left

· Multicast Port - the IP port of the multicast group to be modified or left

This display contains the following data entry fields:

· Pass Blocks Serial I/F 0 - indicates whether or not to pass blocks through to Serial I/F 0 (Y or N) if it is enabled

· Pass Blocks Serial I/F 1 - indicates whether or not to pass blocks through to Serial I/F 1 (Y or N) if it is enabled

· Pass Blocks Serial I/F 2 - indicates whether or not to pass blocks through to Serial I/F 2 (Y or N) if it is enabled

To modify an entry, use the Tab or arrow keys to position the cursor to the desired field. Use the Backspace key to delete the current data and key in the desired value. Press <Control>p to apply the new values.

If no errors were encountered, the configuration file is updated and written to floppy (if a floppy is present in the floppy drive). If 'N' is selected for all boards, the group entry will also be deleted from the SCD configuration file for every board that was originally 'Y'. If a disabled board is changed from 'N" to 'Y', there will be an group entry added in the SCD configuration file for that board but, the group will not be joined (unless joined for another board already) and no data will be passed until that board has been enabled. If an enabled board is changed from 'N' to 'Y', there will be a group entry added in the SCD configuration file for that board, the group will be joined and data will be passed to the board. If a board is changed from 'Y' to 'N', the group entry in the SCD configuration file will be deleted and data will no longer be passed to the board.

3.2.4.5 Modify Misc. Config. Items Display

To modify the current SCD miscellaneous configuration items, select "5" from the Modify SCD Configuration Options Menu and the Modify Misc. Config. Items display in Figure 3-26 will appear:

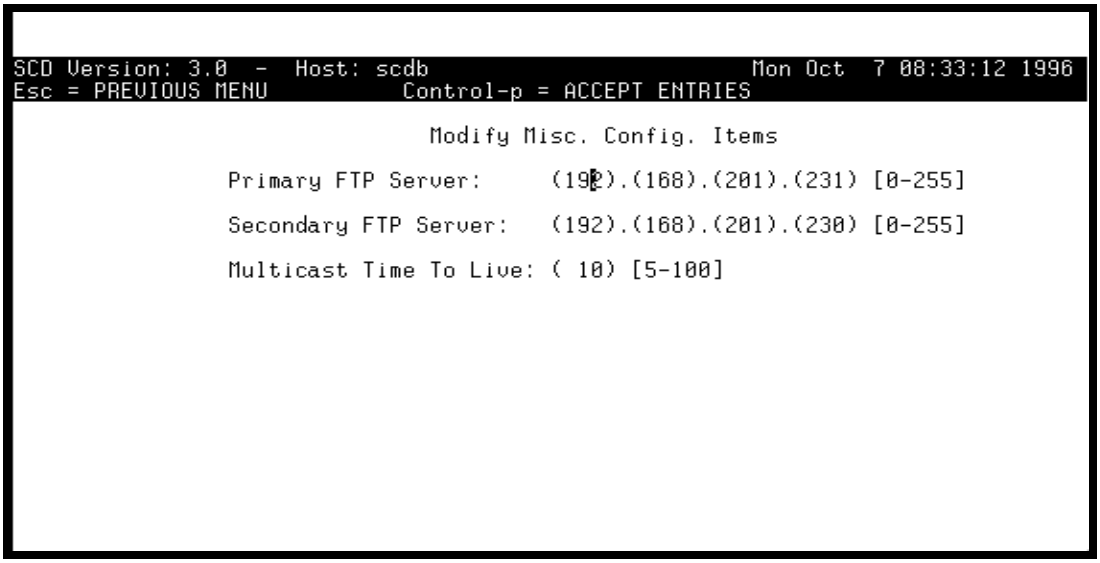

Figure 3-26. Modify Misc. Config. Items Display

This display contains the following data entry fields:

- Primary FTP Server - specifies the IP address of the primary system where configuration and routing table files can be obtained using FTP
- Secondary FTP Server - specifies the IP address of the secondary system where configuration and routing table files can be obtained using FTP
- Multicast Time To Live - specifies the number of jumps that a message can make before timing out

To modify an entry, use the Tab or arrow keys to position the cursor to the desired field. Use the Backspace key to delete the current data and key in the desired value. Press <Control>p to apply the new values.

If no errors were encountered, the configuration file is updated and written to floppy (if a floppy is present in the floppy drive). If the Time To Live value is changed, the SUDPO processes will be terminated and restarted. This will cause an interruption in the data flow.

3.2.4.6 Check For New Config Verify Display

To check for a new SCD configuration file and routing table, select "6" from the Modify SCD Configuration Options Menu and the Check For New Config Verify display in Figure 3-27 will appear:

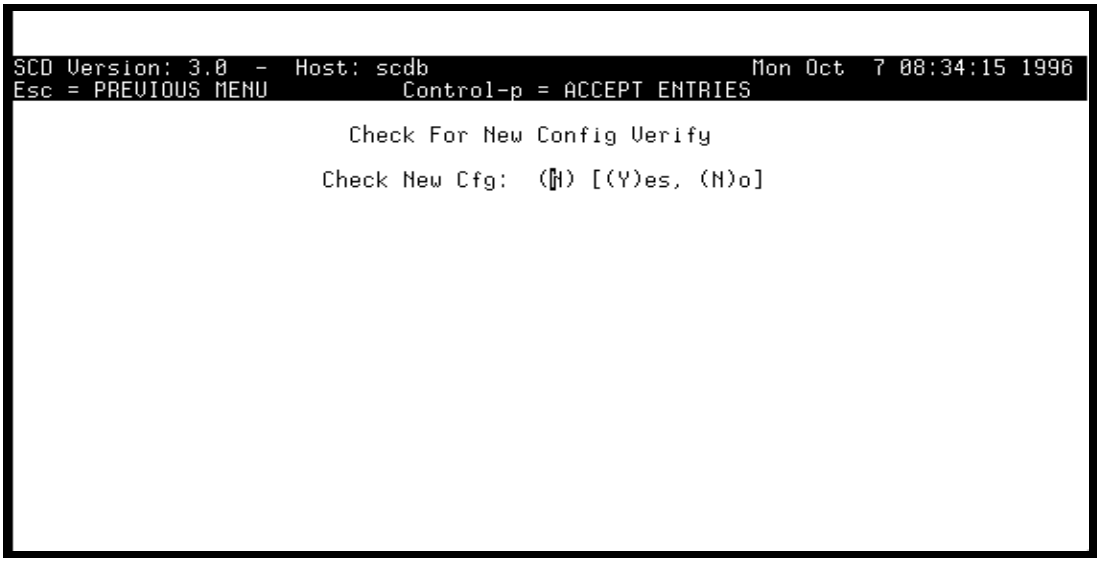

Figure 3-27. Check For New Config Verify Display

This display contains the following data entry fields:

- Check New Cfg - verifies that you want to check for a new SCD configuration file and routing table

To check for a new SCD configuration file, enter a Y in the field and press <Control>p. This will cause the Build Configuration process to check the primary and secondary ftp servers for a new configuration file and routing table file, download them (if found), and process the new configuration file. If any parameters were changed, the SCD Control process will be notified and will terminate and restart any processes that are required for the changes to take effect.

3.2.4.7 Create Configuration Floppy Display

To create a SCD configuration floppy, select “7” from the Modify SCD Configuration Options Menu and the Create Configuration Floppy display in Figure 3-28 will appear:

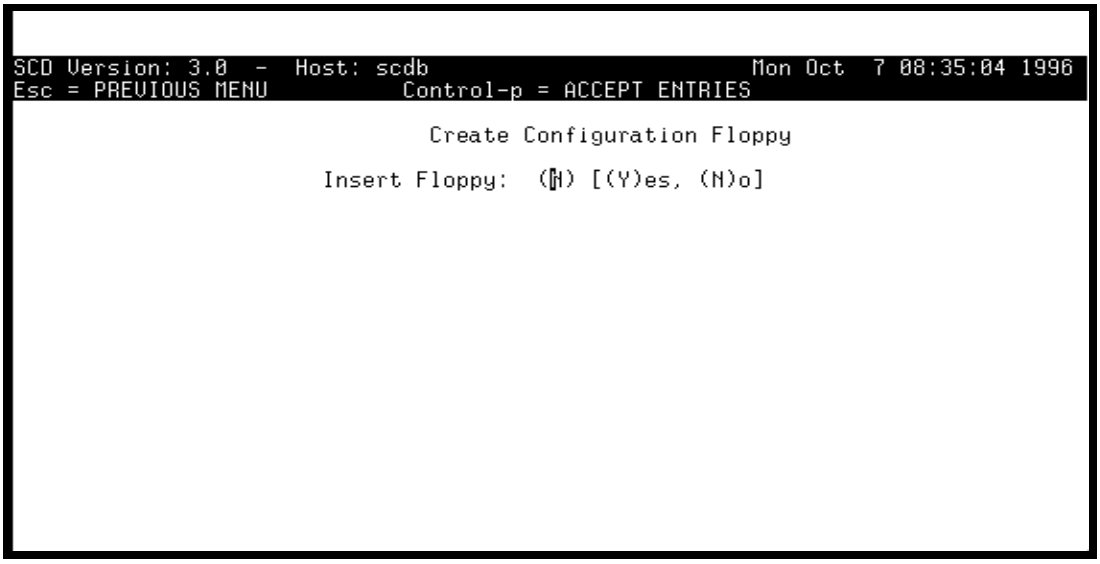

Figure 3-28. Create Configuration Floppy Display

This display contains the following data entry fields:

· Insert Floppy - requests verification that you have a formatted floppy disk loaded in the drive

To create a SCD configuration floppy, enter a Y in the field and press <Control>p. This will cause the current configuration file on disk to be copied to the floppy.

3.2.4.8 Load Configuration Floppy Display

To load a SCD configuration file from floppy, select “8” from the Modify SCD Configuration Options Menu and the Load Configuration Floppy display in Figure 3-29 will appear:

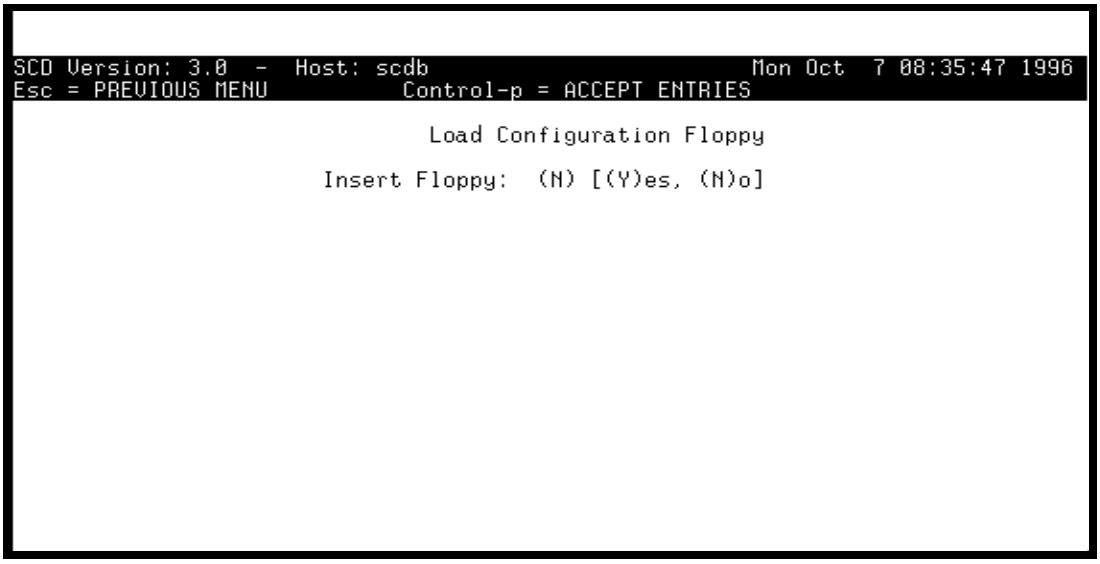

Figure 3-29. Load Configuration Floppy Display

This display contains the following data entry fields:

- Insert Floppy - requests verification that you have the SCD configuration floppy disk loaded in the drive

To load the SCD configuration file, enter a Y in the field and press <Control>p. This will cause the configuration file on floppy to be copied to disk. The configuration file will then be processed by SCFG and notify SCNTR of any processes that must be terminated and restarted for the changes to take effect.

3.2.4.9 Zero Counts Verify Display

To zero the current SCD counts, select “Z” from the Modify SCD Configuration Options Menu and the Zero Counts Verify display in Figure 3-30 will appear:

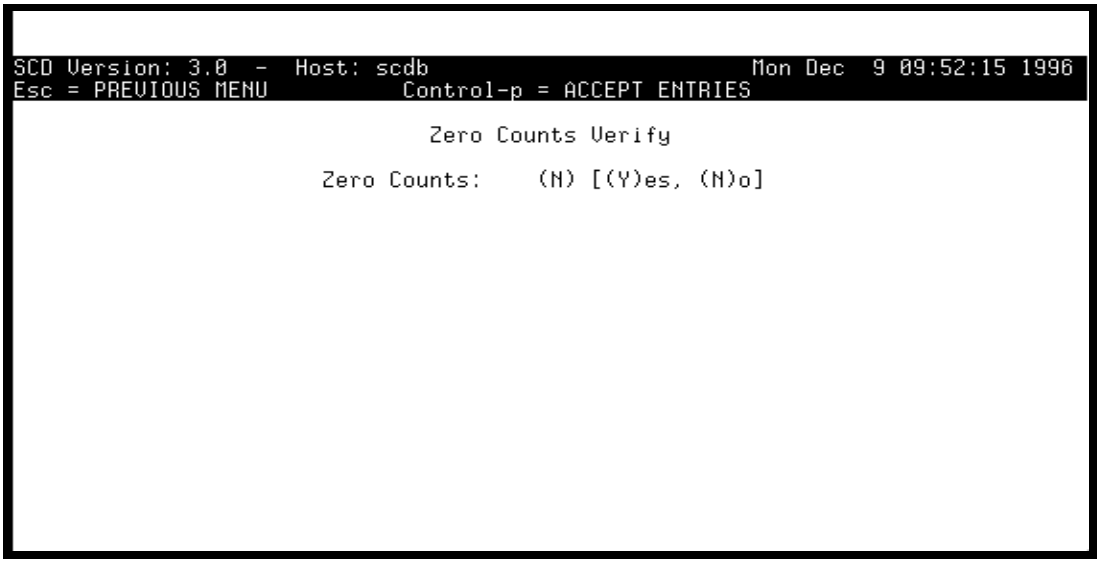

Figure 3-30. Zero Counts Verify Display

This display contains the following data entry fields:

· Zero Counts - verifies that you want to zero the current SCD counts

To Zero Counts, enter a Y in the field and press <Control>p. This will cause the current SCD counts to be zeroed out.

3.2.4.10 Warm Start Verify Display

To initiate a warm start of the SCD, select "W" from the Modify SCD Configuration Options Menu and the Warm Start Verify display in Figure 3-31 will appear:

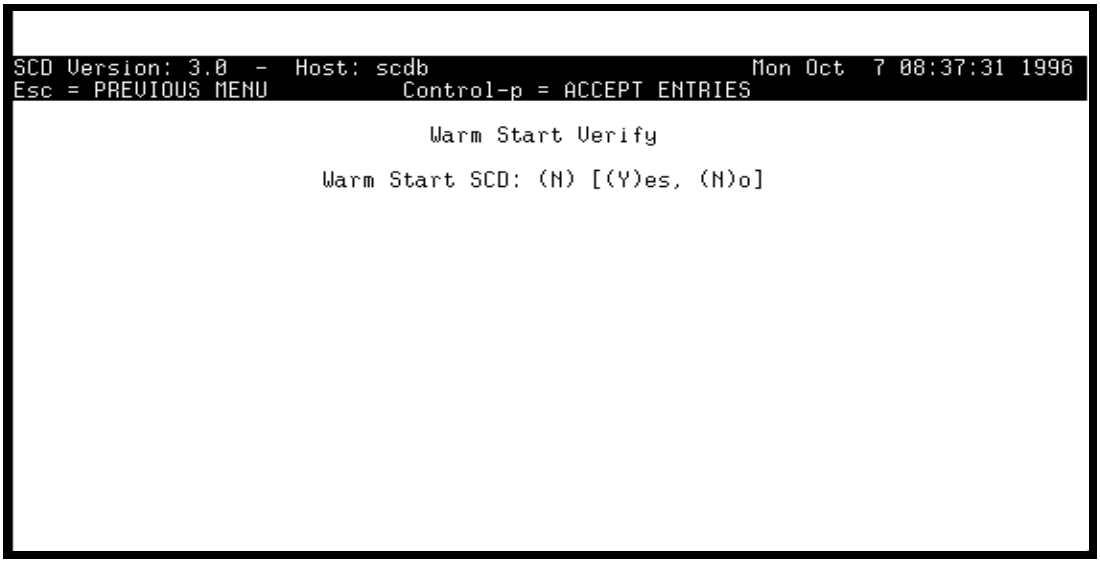

Figure 3-31. Warm Start Verify Display

This display contains the following data entry fields:

· Warm Start SCD - verifies that you want to Warm Start the SCD

To Warm Start the SCD, enter a Y in the field and press <Control>p. This will cause the SCD Control process to terminate all SCD processes. The Build Configuration process will then be started and will check the ftp server for a new configuration file, download it (if found), and process the new file. The SCD Control process will be notified when processing is complete and based on the configurateion file, will start any processes that are required. You can monitor the current status of the processes by viewing the Process Status display.

The SNMP-Agent process is not terminated and started on a Warm Start. You must request a Cold Start in order to restart the SNMP-Agent process.

3.2.4.11 Cold Start Verify Display

To initiate a cold start of the SCD, select “C” from the Modify SCD Configuration Options Menu and the Warm Start Verify display in Figure 3-32 will appear:

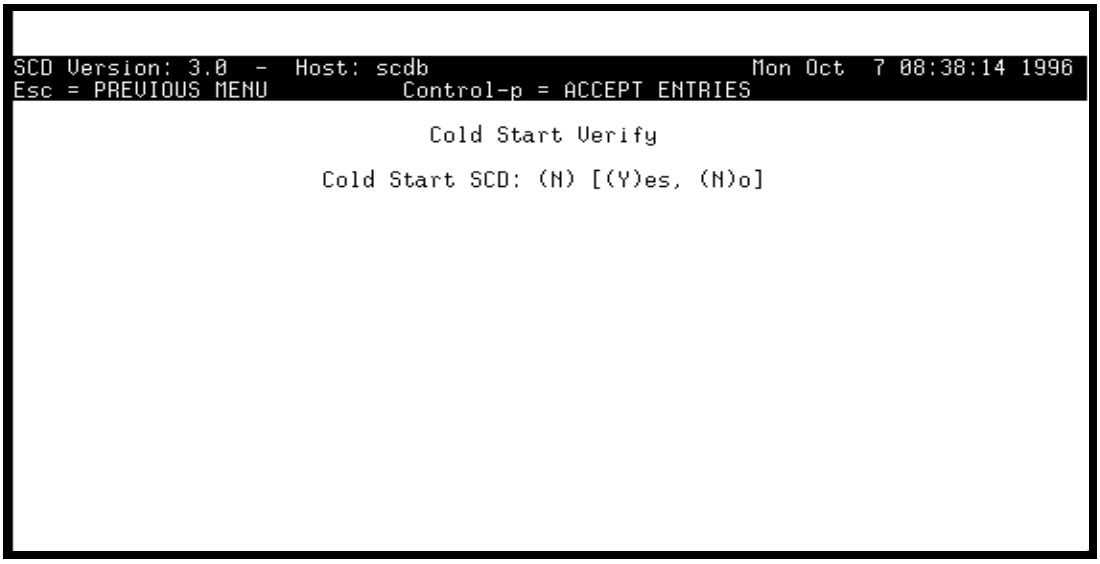

Figure 3-32. Cold Start Verify Display

This display contains the following data entry fields:

· Cold Start SCD - verifies that you want to Cold Start the SCD

To Cold Start the SCD, enter a Y in the field and press <Control>p. This will cause the SCD machine to reboot. You will be logged out and will have to wait until the SCD has restarted before logging back in.

3.2.5 Diagnostics Options Menu

The SCD provides limited diagnostic capabilities. If "4" was selected from the Main Options Menu, the Diagnostics Options Menu in Figure 3-33 will appear:

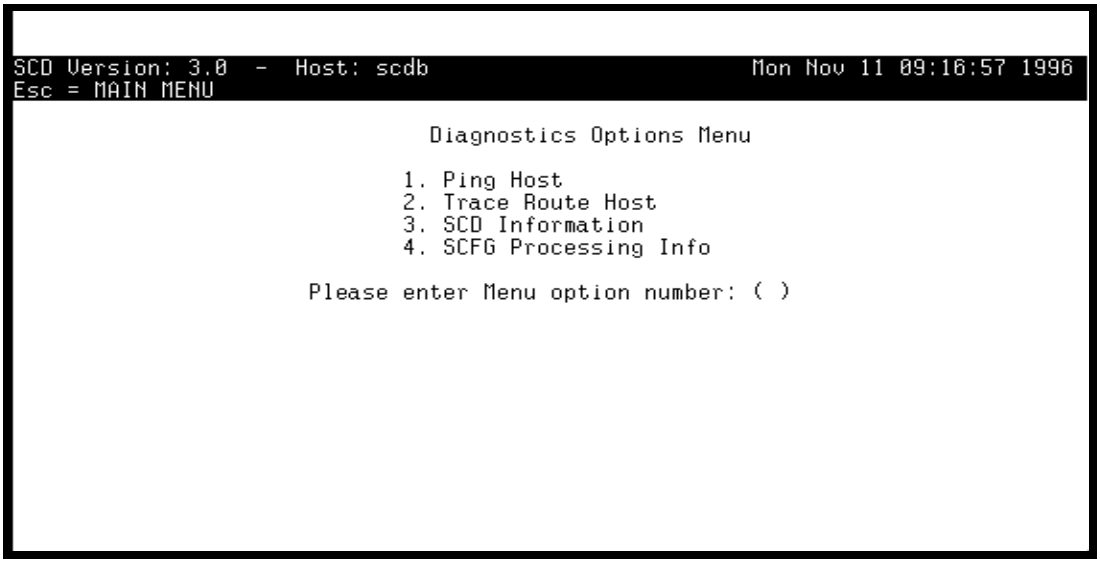

Figure 3-33. Diagnostics Options Menu

Upon selecting an option from the statistics options menu, the requested display will appear.

3.2.5.1 Ping Host Request Display

To ping a host on the network or determine which hosts are listening to a multicast address, select "1" from the Diagnostics Options Menu and the Ping Host Request display in Figure 3-34 will appear:

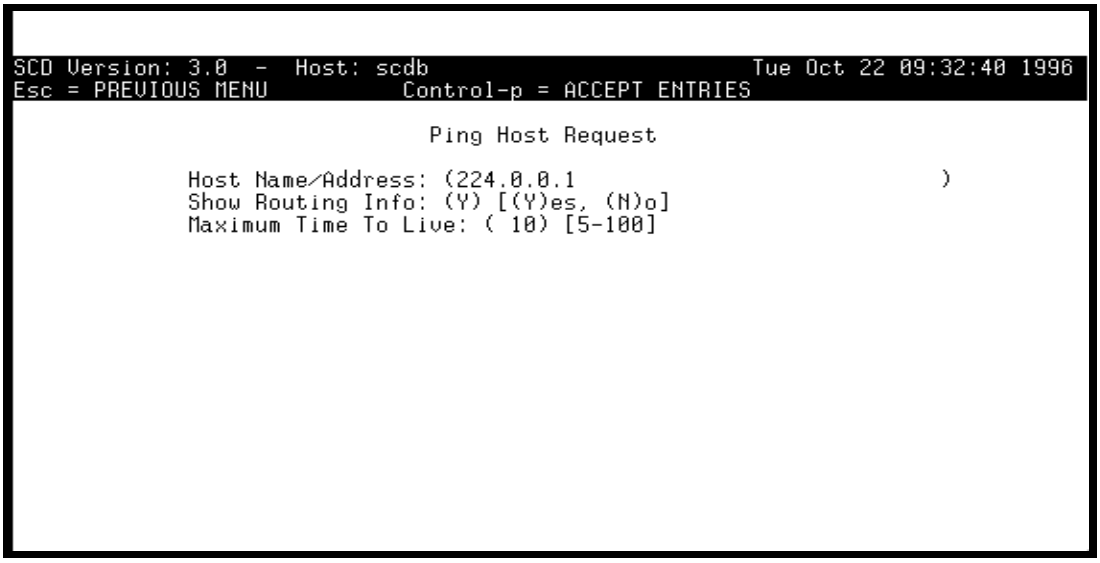

Figure 3-34. Ping Host Request Display

This display contains the following data entry fields:

- Host Name/Address - specifies the host name (i.e. scda.gsfc.nasa.gov) or IP address (i.e. single host-192.168.201.110 or multicast-224.0.0.1) to be pinged.
- Routing Information - specifies whether or not to display the routing information (N or Y)
- Maximum Time To Live - this is the maximum number of hops the message will take to find the requested host (5-100)

WARNING: If the IP address has any leading zeros they will be interpreted as octal numbers and the resulting address may not be what you want (i.e. 150.144.180.045 will be interpreted as 150.144.180.37).

After entering the host name or IP address (either a single host or a multicast address can be specified), press <Control>p. An alert is displayed to inform you that the ping request is being processed. After the ping command has been executed, an alert is displayed to inform you that the ping request has completed and the Ping Host Results display in Figure 3-35 will appear.

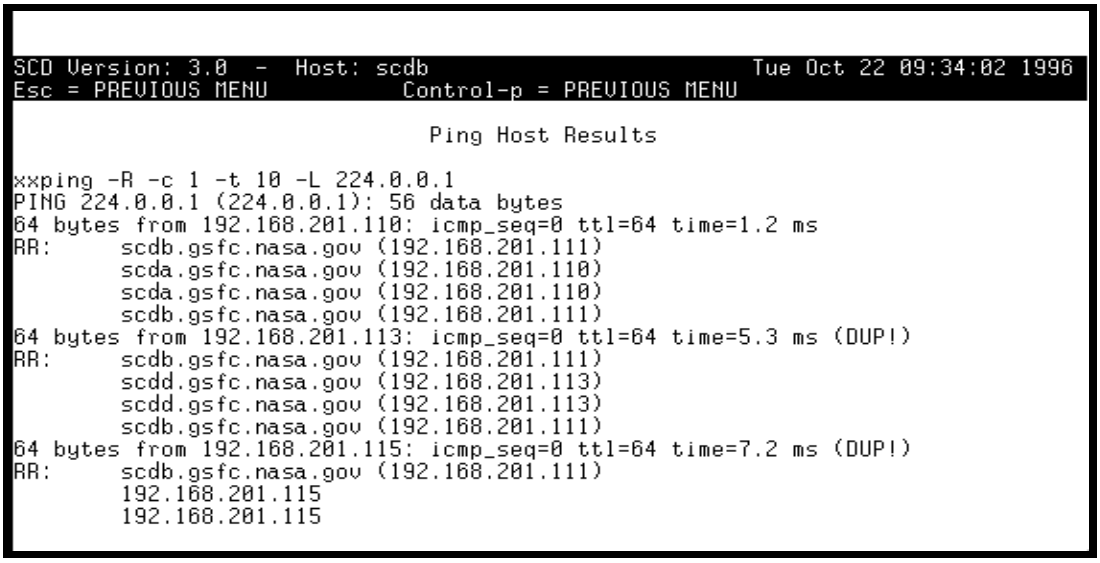

Figure 3-35. Ping Host Results Display

This display contains formatted information on the following:

- The actual ping system command that was executed
- The name and address of the host being pinged or the response: unknown host ‘hostname’
- Routing Information - RR and then the route that the ping took to and from the designated host or hosts if a multicast address was entered.
- Ping Statistics - packets transmitted, packets received, packet loss, and round trip times (only 1 packet is transmitted and there should be 0% packet loss if ping was successful or 100% packet loss if ping was unsuccessful)

3.2.5.2 Trace Route Request Display

To trace the route a message will take to a host on the network, select "2" from the Diagnostics Options Menu and the Trace Route Request display in Figure 3-36 will appear:

Figure 3-36. Trace Route Request Display

This display contains the following data entry fields:

- Host Name/Address - specifies the host name (i.e. scda.gsfc.nasa.gov) or address (192.168.201.110) to be traced
- Maximum Time To Live - this is the maximum number of hops the message will take to find the requested host (5-100)

WARNING: If the IP address has any leading zeros they will be interpreted as octal numbers and the resulting address may not be what you want (i.e. 150.144.180.045 will be interpreted as 150.144.180.37).

After entering the host name or IP address and specifying the maximum time to live, press <Control>p. An alert is displayed to inform you that the traceroute request is being processed. After the traceroute command has been executed, an alert is displayed to inform you that the traceroute request has completed and the Trace Route Results display in Figure 3-37 will appear.

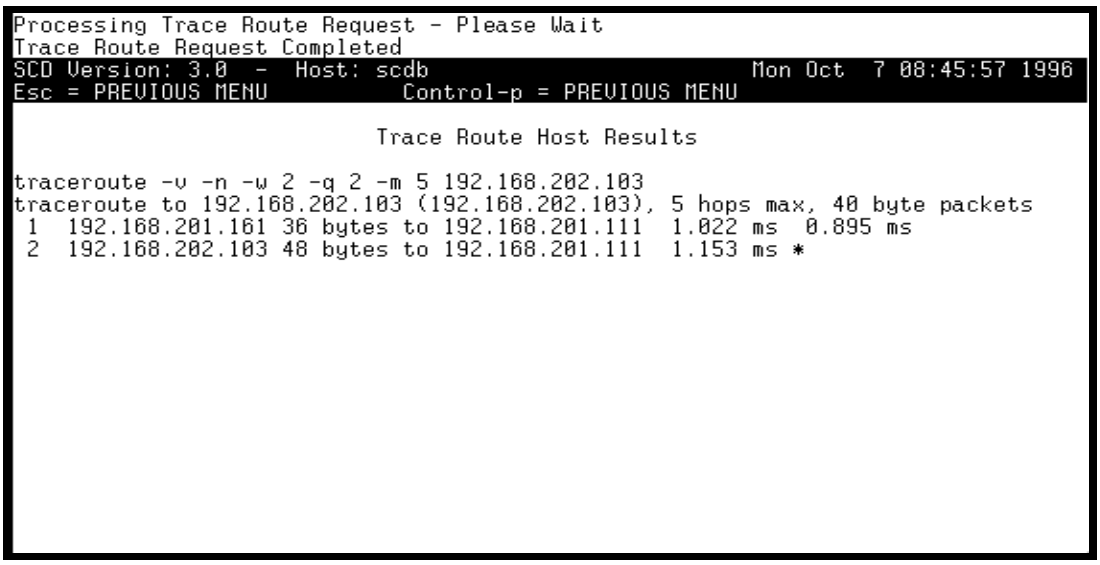

Figure 3-37. Trace Route Results Display

This display contains formatted information on the following:

- The actual traceroute system command that was executed (-v = verbose, -n = specify numeric addresses, -w = wait max of 2 seconds for response, -q = maximum number of queries to each host, -m = maximum number of hops (this is the specified max ttl)
- The address of the host being traced or the response: unknown host ‘hostname’
- Trace Route Statistics - bytes transmitted from the intermediate or end host back to current host, and round trip times or an ‘*’ if no response was received.

The traceroute command attempts to trace the route an IP packet would follow to some internet host by launching UDP probe packets with a small ttl then listening for an Internet Control Message Protocol (ICMP) “time exceeded” reply from a gateway. The probes are started with a ttl of one and increased by one until an ICMP “port unreachable”, which means it got to the host or hit the maximum number of probes (set by the entered ttl). Two probes are sent at each ttl setting and a line is printed showing the ttl, address of the gateway and round trip time of each probe. If the probe answers come from different gateways, the address of each responding system will be printed. If there is no response within a 2 second timeout interval, a “*” is printed for that probe. Traceroute prints a “!” after the time if the ttl is <= 1, a “!H” for got a host, a “!N” for network unreachable, and a “!P” for protocol unreachable.

3.2.5.3 SCD Information Display

To view the current SCD information, select “3” from the Diagnostics Options Menu and the SCD Information display in Figure 3-38 will appear:

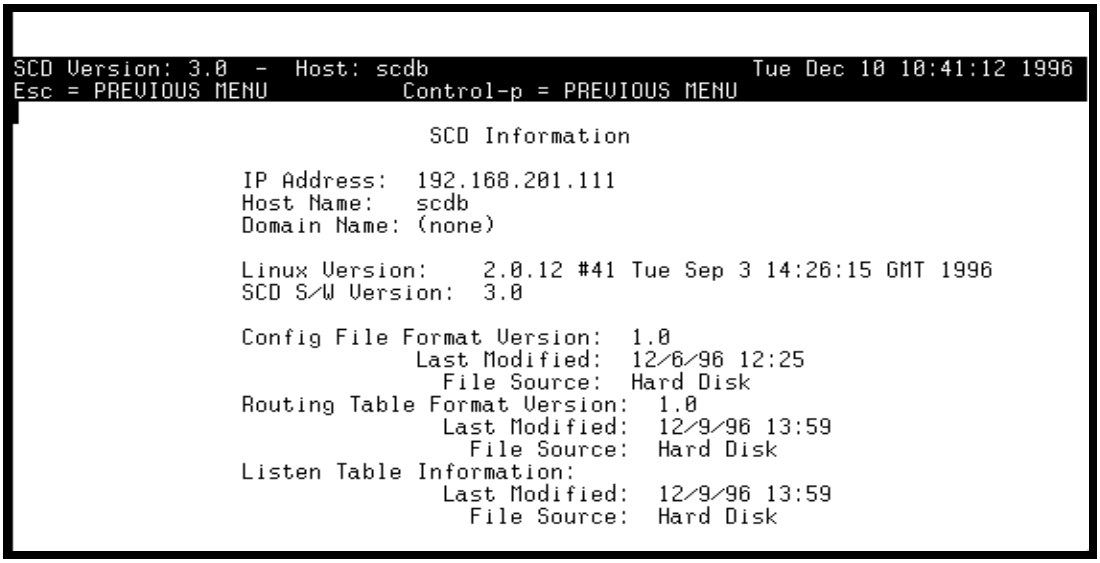

Figure 3-38. SCD Information Display

This display contains formatted information on the following:

- Host IP Address - the IP address xxx.xxx.xxx.xxx of the current host
- Host Name - the host name of the current host
- Domain Name - the domain name of the current host
- Linux Version - the Linux operating system level and build number and the date it was compiled
- SCD S/W Version - the current SCD software version number
- Confiuration File Format Version - the current configuration file format version
- Last Modified - the date and time that the configuration file was last modified
- File Source - the source of the configuration file currently loaded in memory (Primary FTP Server, Secondary FTP Server, Hard Disk, Floppy Disk, or Unknown)
- Routing Table Format Version - the current routing table format version
- Last Modified - the date and time that the routing table file was last modified

- File Source - the source of the routing table file currently loaded in memory (Primary FTP Server, Secondary FTP Server, Hard Disk, Floppy Disk, or Unknown)
- Last Modified - the date and time that the listen table file was last modified
- File Source - the source of the listen table file currently loaded in memory (Primary FTP Server, Secondary FTP Server, Hard Disk, Floppy Disk, or Unknown)

3.2.5.4 SCFG Processing Information Display

To view the current SCD Configuration Utility (SCFG) processing information, select "4" from the Diagnostics Options Menu and the SCFG Processing Information display in Figure 3-39 will appear:

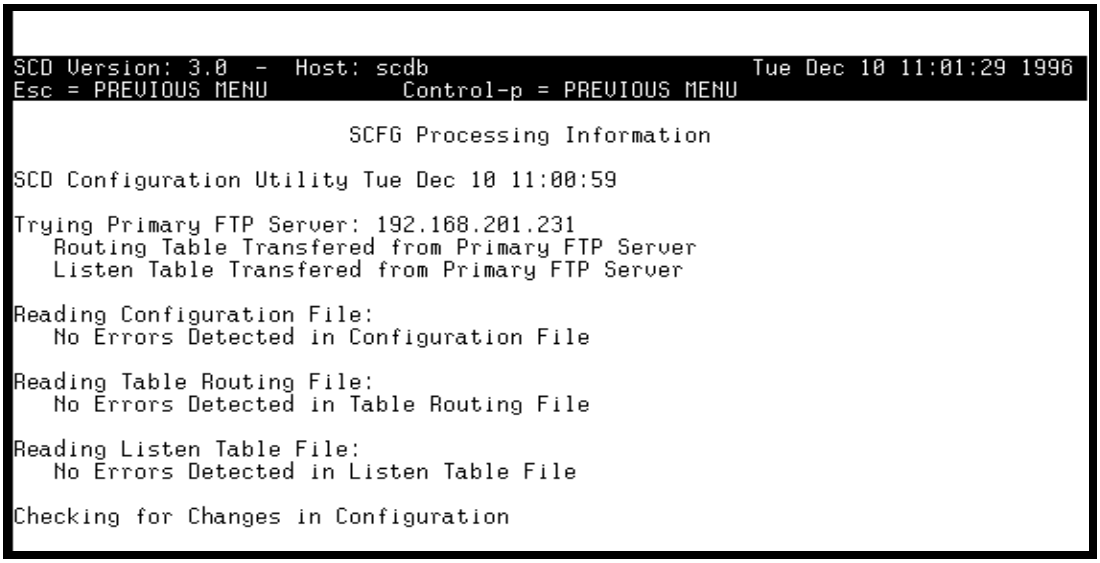

Figure 3-39. SCFG Processing Information (Page 1) Display

To view the next screen of current SCD Configuration Utility (SCFG) processing information, use the down arrow key and the SCFG Processing Information display in Figure 3-40 will appear:

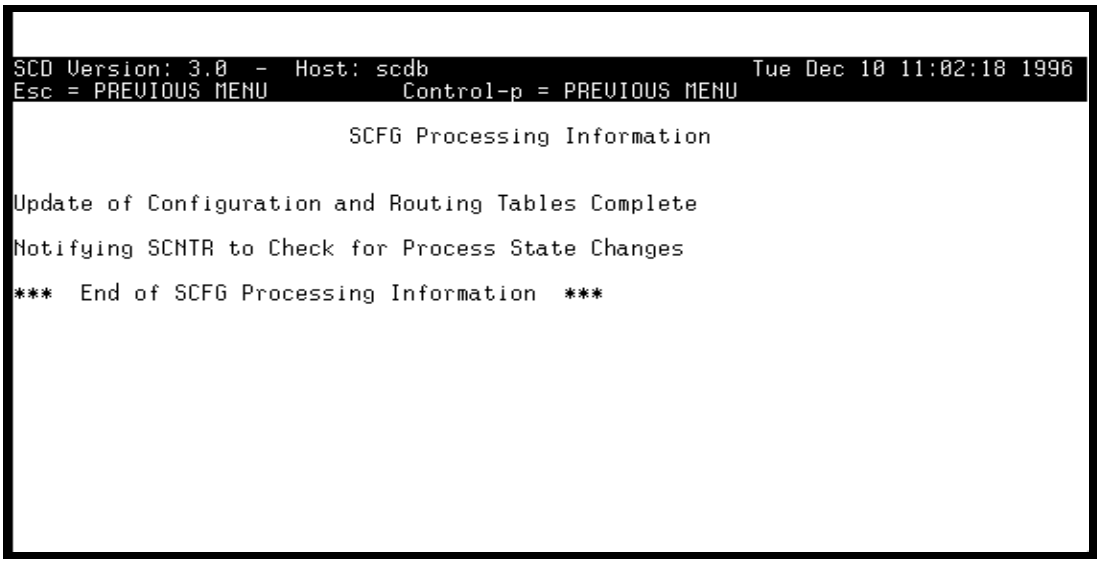

Figure 3-40. SCFG Processing Information (Page 2) Display

These displays contain information on the following:

- Date and time of the last SCFG run
- Any files that were transferred from the Primary FTP server
- Any files that were transferred from the Secondary FTP server
- Any errors detected while processing the configuration file
- Any errors detected while processing the table routing file
- Any errors detected while processing the listen table file
- Checking for changes in the configuration
- Completion Status of the configuration and routing table updates
- Notification of SCNTR to check for process state changes
- End of processing information

Section 4. Alerts and Error Messages

4.1 Overview

The SCD provides a scrolling display of alerts in the upper region of the SCD window. This region displays a maximum of two alerts which are updated from top to bottom (i.e. the newest alert appears at the bottom of the list). When the region is full (two messages are displayed), the addition of a new alert message will cause the oldest message to scroll off the top of the screen. If no new alerts are displayed, the current alerts will scroll up one line every 8 seconds until the alert area is cleared. Alert messages are a maximum of one 80-character line. The SCD also provides a data entry error line at the bottom of the screen to inform the operator of invalid data entries or parameter restrictions.

4.1.1 Types of Alerts

There are two different types of alert messages in the SCD:

a. Results: A result alert is an informative message resulting from SCD functions. An example of an alert message is: Join of Multicast Group Was Successful.

b. Errors: An error message is the result of an unexpected event or failure in the applications software. An example of an error messages is: Could Not Write SCD Configuration File. Also used for data entry error messages that require 2 lines, such as the valid data rates message.

4.1.2 Types of Errors

There are two different types of error messages in the SCD:

a. Field: A field error is when an invalid parameter value has been entered and the operator cannot leave the field until it is corrected. An example of a field error message is: Y(es) or N(o) must be entered.

b. Display: A display error is when valid parameters have been entered in each of the fields but they are inconsistent with each other. An example of a display error messages is: Serial I/F Cannot Be Enabled If Not_Present.

4.2 Alert Messages

4.2.1 Result Alerts

Must Be Logged On As An Administrative User To Modify Configuration

Routing Tables Are Locked or Modified - Please Wait, Then Try Again

Join of Multicast Group Was SUCCESSFUL

Join of Multicast Group Was UNSUCCESSFUL

Modify of Multicast Group Was SUCCESSFUL

Leave of Multicast Group Was SUCCESSFUL

Leave of Multicast Group Was UNSUCCESSFUL

Modify of Configuration Was SUCCESSFUL

Modify of Configuration Was UNSUCCESSFUL

No Modifications Were Made To Configuration

Processing Ping Request - Please Wait

Ping Request Completed

Processing Traceroute Request - Please Wait

Traceroute Request Completed

Check For New SCD Config Initiated - See Process Status Display For Details

Create of SCD Configuration Floppy Complete

Load of SCD Configuration Floppy Complete - Initiating Config. File Processing

Warm Start of SCD Initiated - See Process Status Display For Details

Cold Start of SCD Initiated - You Will Be Logged Out

4.2.2 Error Alerts

Could Not Write SCD Configuration File

Could Not Write SCD Configuration File To Floppy

Load of SCD Configuration Floppy Was Unsuccessful - No Floppy or Bad Format

Load of SCD Configuration Floppy Was Unsuccessful - Not a SCD_CONFIG Floppy

4.3 Error Messages

4.3.1 Field Errors

Invalid menu selection

(Y)es or (N)o must be entered

DROP or PASS must be entered

NOT_PRESENT or PRESENT must be entered

DISABLED or ENABLED must be entered

FIXED or TABLE must be entered

R, W, or RW must be entered

Invalid Baudrate - must be entered as NNNN.NN

Invalid Baudrate - must be less than or equal to 1544Kbps

Invalid Baudrate - must be greater than or equal to 0.02Kbps

Invalid Rate - 0-1000 must be entered

Invalid Block Padding - 0-28 must be entered

Invalid IP Address - 0-255 must be entered

Invalid IP Port - 1-65535 must be entered

Invalid Multicast TTL - 5-100 must be entered

4.3.2 Display Errors

At Least One Board Must Be (Y)es

Specified IP Address is Not Class D or Local Host Address

Already Joined To Specified Multicast IP Address/Port

Serial I/F Cannot Be Enabled If Not_Present

Serial I/F Cannot Be Enabled With a Zero Data Rate

The 2 Board Maximum Throughput of 3584Kbps Has Been Exceeded

The 3 Board Maximum Throughput of 3584Kbps Has Been Exceeded

Abbreviations and Acronyms

DCN	Document Change Notice
DMS	Digital Matrix Switch
GSFC	Goddard Space Flight Center, Greenbelt, MD
ICMP	Internet Control Message Protocol
IONET	Internet Protocol Operational Network
IP	Internet Protocol
JSC	Lyndon B. Johnson Space Center, Houston, TX
LAN	Local Area Network
MDM	Multiplexer/Demultiplexer
MSS	Message Switching System
Nascom	NASA Communications
NASCOP	Nascom Operational Procedures
NIB	Nascom Interface Board
NMS	Network Management System
NOC	Network Operations Center
NYI	Not Yet Implemented
SCD	Small Conversion Device
SNMP	Simple Network Management Protocol
SOI	SCD Operator Interface
STDN	Space Tracking Data Network
TBD	To Be Determined
TDS	Tracking Data System